

NAVAL SHIPS' TECHNICAL MANUAL

CHAPTER 700

SHIPBOARD AMMUNITION HANDLING AND STOWAGE

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TABLE OF CONTENTS

Chapter/Paragraph	Page
700 SHIPBOARD AMMUNITION HANDLING AND STOWAGE	700-1
SECTION 1. GENERAL INFORMATION	700-1
700-1.1 INTRODUCTION	700-1
700-1.1.1 PURPOSE.	700-1
700-1.1.2 SCOPE.	700-1
700-1.1.3 APPLICABILITY.	700-1
700-1.1.4 ADDITIONAL REQUIREMENTS.	700-1
700-1.1.5 COMPLIANCE.	700-2
700-1.2 SAFETY PRECAUTIONS	700-2
700-1.2.1 GENERAL.	700-2
700-1.2.2 SPECIFIC PRECAUTIONS	700-2
700-1.2.3 OTHER PRECAUTIONS.	700-3
SECTION 2. DESCRIPTION	700-3
700-2.1 GENERAL	700-3
700-2.1.1 INTRODUCTION.	700-3
700-2.1.2 AMMUNITION HANDLING EQUIPMENT.	700-3
700-2.2 HOISTS	700-4
700-2.2.1 WHIP HOIST.	700-4
700-2.2.1.1 Powered Whip Hoist System.	700-4
700-2.2.1.2 Manual Whip Hoist.	700-4
700-2.2.2 MANUALLY-OPERATED HOIST.	700-4
700-2.2.3 ELECTRIC AND PNEUMATIC CHAIN HOIST.	700-4
700-2.2.4 ELECTRIC AND PNEUMATIC WIRE ROPE HOIST.	700-7
700-2.2.4.1 Pneumatic Cylinder Hoist.	700-7
700-2.2.4.2 Hydraulic Cylinder.	700-7
700-2.2.5 HYDRAULIC HOIST.	700-7
700-2.2.6 TROLLEY HOIST.	700-7
700-2.3 BRIDGE CRANE	700-8
700-2.4 DUMBWAITER	700-9
700-2.4.1 GENERAL.	700-9
700-2.4.2 TYPE 1.	700-9
700-2.4.3 TYPE 2.	700-10
700-2.4.4 SAFETY DOORS.	700-10
700-2.4.5 CONTROL SYSTEM.	700-10
700-2.4.6 MANUAL OPERATION.	700-11
700-2.5 ELEVATORS	700-11

TABLE OF CONTENTS - Continued

Chapter/Paragraph	Page
700-2.6 CARGO AND WEAPONS CONVEYORS	700-11
700-2.7 SCUTTLES	700-11
700-2.7.1 GENERAL.	700-11
700-2.7.2 ROTATING SCUTTLE.	700-11
700-2.7.3 FLAP SCUTTLE.	700-11
700-2.8 UNDERWAY REPLENISHMENT GEAR	700-11
700-2.9 AMMUNITION LIFTING EQUIPMENT	700-14
700-2.10 ASSOCIATED AMMUNITION HANDLING EQUIPMENT	700-14
700-2.10.1 MONORAIL AND BIRAIL TRACKS.	700-14
700-2.10.2 PADEYES AND SHACKLES.	700-14
700-2.10.3 KINGPOST AND BOOM.	700-15
700-2.10.4 J-DAVIT.	700-15
700-2.11 GLOSSARY	700-15
SECTION 3. OPERATIONAL AND MAINTENANCE GUIDE	700-20
700-3.1 INTRODUCTION	700-20
700-3.2 HOIST OPERATIONS	700-21
700-3.2.1 GENERAL.	700-21
700-3.2.2 SAFE HOIST OPERATIONS.	700-21
700-3.2.2.1 Before Operating the Hoist.	700-21
700-3.2.3 OPERATIONAL CHECKS.	700-24
700-3.2.4 OPERATION OF HOIST WITH LOAD	700-24
700-3.2.5 AFTER HOIST USE	700-24
700-3.2.6 MAINTENANCE.	700-25
700-3.2.7 UNSAFE HOIST OPERATION PRACTICES.	700-25
700-3.3 MAINTENANCE OVERVIEW	700-26
700-3.3.1 PLANNED MAINTENANCE SYSTEM (PMS).	700-26
700-3.3.2 MAINTENANCE GUIDELINES.	700-26
700-3.3.3 PRE-MAINTENANCE PROCEDURES.	700-26
700-3.3.4 TAGOUT PROCEDURE.	700-26
700-3.3.5 LUBRICATION.	700-27
700-3.3.6 COUPLINGS AND CLUTCHES.	700-27
700-3.3.7 PROCUREMENT OF HOISTS OR PARTS.	700-27
700-3.4 PREVENTIVE HOIST MAINTENANCE (INDIVIDUAL EQUIPMENT)	700-27
700-3.4.1 WHIP HOISTS.	700-27
700-3.4.2 ELECTRIC HOIST.	700-27
700-3.4.3 TROLLEY HOISTS.	700-27
700-3.4.4 CHAIN/WIRE ROPE EXAMINATION.	700-27

TABLE OF CONTENTS - Continued

Chapter/Paragraph	Page
700-3.4.5 HOOK EXAMINATION.	700-27
700-3.4.6 PNEUMATIC HOISTS.	700-28
700-3.4.7 HYDRAULIC HOISTS.	700-28
700-3.4.8 DUMBWAITERS.	700-28
700-3.5 OPERATION AND MAINTENANCE OF SCUTTLES	700-28
700-3.6 MONORAIL AND BIRAIL TRACKS, PADEYES AND SHACKLES	700-28
700-3.7 LIFTING EQUIPMENT RATINGS	700-29
700-3.8 TROUBLESHOOTING (ELECTRICAL AND PNEUMATIC EQUIPMENT)	700-29
700-3.8.1 GENERAL.	700-29
700-3.8.2 PNEUMATIC HOISTS.	700-29
700-3.8.3 ELECTRIC HOISTS.	700-30
SECTION 4. INSPECTION, TESTING AND REPAIR	700-30
700-4.1 INTRODUCTION	700-30
700-4.1.1 GENERAL.	700-30
700-4.1.2 EQUIPMENT PREPARATION.	700-30
700-4.1.3 SAFETY PRECAUTIONS.	700-30
700-4.2 INSPECTION AND TEST REQUIREMENTS	700-30
700-4.2.1 AMMUNITION HANDLING EQUIPMENT.	700-30
700-4.2.2 AMMUNITION LIFTING EQUIPMENT.	700-31
700-4.2.3 INSPECTION CRITERIA.	700-31
700-4.2.4 INSPECTION METHODS.	700-31
700-4.2.5 PRE-INSPECTION REQUIREMENTS.	700-32
700-4.2.6 FIRST USE OF EACH SHIFT INSPECTION.	700-32
700-4.2.7 BEFORE AND AFTER INSPECTION OF SUBMARINE WEAPONS HANDLING AND STOWAGE EQUIPMENT.	700-32
700-4.2.8 INSPECTION OF NEW HOIST HOOKS.	700-32
700-4.3 ANNUAL INSPECTION OF COMPONENTS	700-33
700-4.3.1 GENERAL.	700-33
700-4.3.2 ANNUAL INSPECTION.	700-33
700-4.3.2.1 Replacement Fasteners.	700-33
700-4.3.3 ANNUAL INSPECTION OF SUBMARINE WEAPONS HANDLING AND STOWAGE EQUIPMENT.	700-33
700-4.3.4 MACHINERY FOUNDATIONS.	700-33
700-4.3.5 STRUCTURE, STRUCTURAL MEMBERS AND STRONGBACKS. . . .	700-33
700-4.3.6 HANDRAILS, LADDERS, WALKWAYS AND PERSONNEL SAFETY GUIDES.	700-33
700-4.3.7 SLEWING GEARS AND BEARING ASSEMBLIES.	700-34
700-4.3.8 DRIVE SHAFTS, COUPLINGS AND OPEN GEARS.	700-34
700-4.3.9 ENCLOSED REDUCTION GEARS.	700-34

TABLE OF CONTENTS - Continued

Chapter/Paragraph		Page
700-4.3.10	POSITIVE LIMIT STOPS.	700-34
700-4.3.11	BRAKE SYSTEMS.	700-34
700-4.3.12	WIRE ROPE DRUMS.	700-34
700-4.3.13	WIRE ROPE.	700-34
700-4.3.14	WIRE ROPE AND FITTINGS AND EYE SPLICES.	700-34
700-4.3.15	WIRE ROPE SHEAVES.	700-34
700-4.3.16	HOISTING LOAD BLOCKS, CLEVISES AND HOOKS.	700-35
700-4.3.16.1	Chain Guides and Supports.	700-35
700-4.3.17	ELECTRICAL COMPONENTS.	700-35
700-4.3.18	EMERGENCY STOP AND INTERLOCK SWITCHES.	700-35
700-4.3.19	OPERATING CUTOFF AND LIMIT SWITCHES.	700-35
700-4.3.20	WARNING DEVICES.	700-35
700-4.3.20.1	Warning and Operating Instruction Plates.	700-35
700-4.3.21	MONORAIL AND BIRAIL TRACKS AND PADEYES.	700-35
700-4.3.22	DOORS.	700-35
700-4.3.23	OVERHEAD TROLLEY HOIST AND BRIDGE CRANE SUPPORT RAILS.	700-35
700-4.3.24	CROSSOVER RAILS.	700-35
700-4.3.25	BRIDGE CRANE.	700-36
700-4.3.26	TROLLEYS.	700-36
700-4.3.27	MANUAL DRIVE ASSEMBLY.	700-36
700-4.3.28	HOIST LOAD CHAIN.	700-36
700-4.3.28.1	Chain Inspection.	700-36
700-4.3.28.2	Chain Replacement.	700-36
700-4.3.29	LINK CHAIN.	700-37
700-4.3.30	ROLLER CHAIN.	700-39
700-4.3.31	PNEUMATIC SUPPLY SYSTEM.	700-39
700-4.3.32	PNEUMATIC MOTORS AND BRAKES.	700-39
700-4.3.33	HYDRAULIC AND PNEUMATIC ACTUATING CYLINDERS.	700-39
700-4.3.34	HYDRAULIC PUMPS AND MOTORS.	700-39
700-4.3.35	NATURAL AND SYNTHETIC FIBER ROPES.	700-40
700-4.3.36	J-DAVITS AND KINGPOSTS AND BOOMS.	700-40
700-4.4	SAFETY GUIDELINES FOR TESTING	700-40
700-4.5	TESTING	700-40
700-4.5.1	NO-LOAD TEST.	700-40
700-4.5.1.1	Crane and Hoist Load Hooks and Dumbwaiters.	700-40
700-4.5.1.2	Hoist Trolleys.	700-40
700-4.5.1.3	Bridge Cranes.	700-40
700-4.5.1.4	Traveling Cranes.	700-40
700-4.5.1.5	Rotating King Posts, Pedestal and Traveling Mounted Cranes.	700-40
700-4.5.1.6	Equipment with Unusual Operating Features.	700-40
700-4.5.1.7	Component Inspection.	700-41
700-4.5.2	LOAD TESTING.	700-41
700-4.5.2.1	Load Testing Requirements.	700-41
700-4.5.2.2	Sequence of Testing.	700-42

TABLE OF CONTENTS - Continued

Chapter/Paragraph		Page
700-4.5.2.3	Sequence of Load Testing and Inspections.	700-43
700-4.5.2.4	Complex Handling Equipment.	700-43
700-4.5.2.5	Test Equipment.	700-43
700-4.5.2.6	Authorized Testing Activities.	700-43
700-4.5.3	STATIC LOAD TEST.	700-43
700-4.5.3.1	Equipment Positioning.	700-44
700-4.5.3.2	Safety Precautions.	700-44
700-4.5.3.3	Application.	700-44
700-4.5.3.4	Equipment.	700-44
700-4.5.3.5	Test Load Methods.	700-44
700-4.5.3.6	Method 1 for Static Loading.	700-44
700-4.5.3.7	Method 2 for Static Loading.	700-45
700-4.5.3.8	Method 3 for Static Loading.	700-45
700-4.5.3.9	Observations and Inspections.	700-45
700-4.5.3.10	Inspection of Hooks.	700-45
700-4.5.4	DYNAMIC LOAD TEST.	700-46
700-4.5.4.1	Pre-test Requirements and Precautions.	700-46
700-4.5.4.2	Method of Testing.	700-47
700-4.5.4.3	Observation and Inspection.	700-47
700-4.5.5	RATED LOAD TEST.	700-47
700-4.5.5.1	Method of Testing.	700-47
700-4.5.5.2	Interlock Testing.	700-49
700-4.5.5.3	Observations and Inspections.	700-49
700-4.5.6	WHIP HOIST SLACK CABLE (RAIL CLAMP) SAFETY DEVICE OPERATIONAL TEST (TYPICAL TEST).	700-49
700-4.5.6.1	Preparations.	700-49
700-4.5.6.2	Procedures.	700-52
700-4.6	INSPECTION AND TEST RECORDS	700-53
700-4.6.1	MARKING SAFE HANDLING EQUIPMENT.	700-53
700-4.6.2	MARKING DEFECTIVE HANDLING EQUIPMENT.	700-54
700-4.6.3	MARKING METHOD.	700-54
700-4.6.4	COLOR CODING.	700-55
700-4.6.5	PERMANENT LOG.	700-55
700-4.6.6	SUBMARINE WEAPONS HANDLING AND STOWAGE EQUIPMENT.	700-56
700-4.6.6.1	Identification of Equipment.	700-56
700-4.6.6.2	Recording Test Data.	700-56
700-4.6.6.3	Marking Defective Handling Equipment.	700-56
SECTION 5.	AMMUNITION STOWAGE	700-58
700-5.1	INTRODUCTION	700-58
700-5.1.1	GENERAL.	700-58
700-5.1.2	MAGAZINE ALTERATIONS.	700-58
700-5.2	SAFETY PRECAUTIONS	700-58
700-5.2.1	EXPLOSIVES.	700-58

TABLE OF CONTENTS - Continued

Chapter/Paragraph	Page
700-5.2.2 COMBUSTIBLE MATERIAL.	700-58
700-5.2.3 FLAMMABLE LIQUIDS.	700-58
700-5.3 MAGAZINE SPRINKLER SYSTEMS	700-58
700-5.4 ALARMS	700-59
700-5.5 TEMPERATURE CONTROL	700-59
700-5.5.1 GENERAL.	700-59
700-5.5.2 MAGAZINE VENTILATION.	700-59
700-5.6 ACCESSIBILITY	700-59
700-5.7 IDENTIFICATION	700-59
700-5.8 CLEANLINESS	700-59
700-5.9 STOWAGE FITTINGS AND EQUIPMENT INSPECTION	700-60
700-5.10 LOAD TESTING	700-61
700-5.10.1 SURFACE SHIPS.	700-61
700-5.10.2 SUBMARINES.	700-61
700-5.11 REGULATIONS FOR AMMUNITION STOWAGE	700-61
700-5.11.1 GENERAL.	700-61
700-5.11.2 PRACTICE, DUMMY/DRILL AMMUNITION AND INERT COMPONENTS.	700-61
700-5.12 STOWAGE LOCATION	700-61
700-5.13 READY-SERVICE LOCKERS	700-61
700-5.13.1 DESCRIPTION.	700-61
700-5.13.2 SUNSHIELDS.	700-62
700-5.13.3 FLARE LOCKERS.	700-62
700-5.13.4 LOCKER USE.	700-62
700-5.14 GUN AMMUNITION	700-62
700-5.15 BOMBS AND MISSILES	700-62
700-5.16 FUSES, PRIMERS, BOOSTERS, AND DETONATORS	700-62
700-5.17 TORPEDOES	700-63
700-5.17.1 AIR LAUNCHED.	700-63
700-5.17.2 TUBE-FIRED.	700-63
700-5.18 LANDING FORCE OPERATIONAL RESERVE MATERIAL (LFORM) AMMUNITION	700-63

TABLE OF CONTENTS - Continued

Chapter/Paragraph	Page
700-5.19 CHEMICAL WEAPONS	700-63
700-5.19.1 DIRECTION.	700-63
700-5.19.2 AUTHORIZED CHEMICAL AMMUNITION.	700-63
700-5.20 SMALL ARMS SECURITY	700-63
700-5.21 HIGH-SECURITY HASPS AND PADLOCKS	700-64
700-5.22 DOORS AND HATCHES	700-64
700-5.22.1 ENTRANCES.	700-64
700-5.22.2 ENTRANCE LIGHTING.	700-64
700-5.22.3 ENTRANCE SIGNS.	700-64
700-5.22.4 DOOR HINGES.	700-64
700-5.22.5 LOCKER HINGES.	700-64
700-5.23 ARMORIES AND SMALL ARMS MAGAZINE	700-65
700-5.23.1 DESCRIPTION.	700-65
700-5.23.2 CONSTRUCTION.	700-68
700-5.23.3 SMALL ARMS STOWAGE REQUIREMENTS.	700-68
700-5.23.4 SMALL ARMS LOCKERS.	700-68
700-5.24 TROOP WEAPONS STOWAGE	700-68
700-5.24.1 DESCRIPTION.	700-68
700-5.24.2 EXCEPTIONS.	700-68
700-5.25 RIFLE RACK KEY STOWAGE	700-68
700-5.26 SPARE LOCK CYLINDERS	700-69
700-5.27 SUBMARINE SMALL ARMS AND MISCELLANEOUS SENSITIVE ORDNANCE STOWAGE	700-69

LIST OF TABLES

Table	Title	Page
700-4-1.	LOAD TESTING FOLLOWING MAINTENANCE	700-31
700-4-2.	LIST OF TEST LOADS/METHODS AND INSPECTION PROCEDURES DOCUMENTS	700-33
700-4-3.	LOAD TESTING EXCEPTIONS AND VARIATIONS	700-36
700-4-4.	LINK CHAIN REPLACEMENT CRITERIA	700-39
700-4-5.	LOAD BEARING COMPONENTS	700-42
700-4-6.	SEQUENCE OF LOAD TESTING AND INSPECTIONS	700-43
700-4-7.	HOOK THROAT OPENINGS*	700-47
700-4-8.	HOOK DEFORMATION VALUES	700-48

LIST OF ILLUSTRATIONS

Figure	Title	Page
	Certification Sheet	0-2
700-2-1.	Hoists	700-5
700-2-2.	Powered Whip Hoist System	700-6
700-2-3.	Pneumatic Cylinder Hoist	700-8
700-2-4.	Pneumatic Bridge Crane and Trolley Hoist	700-9
700-2-5.	Dumbwaiter	700-10
700-2-6.	Typical Elevator for Surface Combatant Ships	700-13
700-2-7.	Passing Scuttles	700-14
700-2-8.	Kingpost and Boom	700-15
700-2-9.	Load Clevis	700-18
700-3-1.	Inspection for Twisted Chains	700-23
700-4-1.	Chain Link Measurement	700-37
700-4-2.	Chain Gauge Length	700-38
700-4-3.	Load Hook	700-49
700-4-4.	Slack Cable Device Test	700-51
700-4-5.	Periodic Load Test Record Strap	700-55
700-4-6.	Sample Test Record Sheet	700-57
700-5-1.	Sign on Outside of Ammunition Stowage Space	700-60
700-5-2.	Magazine and Armory Access Door Security Bracket	700-66
700-5-3.	Topside Locker Retaining Bracket	700-67

NOTE

THIS CHAPTER HAS BEEN REFORMATTED FROM DOUBLE COLUMN TO SINGLE COLUMN TO SUPPORT THE NSTM DATABASE. THE CONTENT OF THIS CHAPTER HAS NOT BEEN CHANGED.

CHAPTER 700

SHIPBOARD AMMUNITION HANDLING AND STOWAGE

SECTION 1.

GENERAL INFORMATION

700-1.1 INTRODUCTION

700-1.1.1 PURPOSE. This section will provide general technical information, emphasize safety precautions and specify requirements, instructions and documents that will ensure safe operation and efficient utilization of shipboard ammunition handling and stowage equipment that is under the cognizance of Naval Sea Systems Command (NAVSEA).

700-1.1.2 SCOPE. This NSTM chapter identifies the operating, maintenance, testing and inspection requirements which will ensure safe, trouble-free use of the applicable ammunition handling and stowage equipment. This chapter and the referenced documents are not intended to supersede any established Planned Maintenance System (PMS) or similar procedures developed for a specific system or piece of equipment. The requirements specified in the following paragraphs are minimum standards and are not to be construed as limiting the authority of a Type Commander to impose additional or more restrictive requirements. PMS, at a minimum, shall include the inspection and testing requirements contained in this chapter. Guided missile launchers, launching systems and gun mounts are not covered in this chapter. Information about this equipment is contained in the technical documentation for each of those specific pieces of equipment.

700-1.1.3 APPLICABILITY. This chapter applies to all shipboard ammunition handling and stowage equipment. For information on related handling equipment, refer to:

- a. Cargo Weapons Elevators, see **NSTM Chapter 772** .
- b. Cranes, see **NSTM Chapter 589** .
- c. Shipboard Stores and Provisions Handling Equipment, see **NSTM Chapter 572** .
- d. Booms, see **NSTM Chapter 573** .
- e. Specific ammunition lifting equipment, see NAVSEA OP 2173 (Vol. I and Vol. II), **Approved Handling Equipment for Weapons and Explosives**
- f. Gravity, Belt or Vertical Package Conveyors, see **NSTM Chapter 572** .
- g. Underway Replenishment Gear, see **NSTM Chapter 571** .

NOTE

Cranes and Booms in accordance with NSTM Chapters 589 and 573, respectively, may be used for ammunition handling.

700-1.1.4 ADDITIONAL REQUIREMENTS. In addition to the requirements stated in this chapter, there are detailed ammunition handling and stowage requirements and safety precautions in NAVSEA Publications: OP 4, **Ammunition Afloat** ; OP 1014, **Ordnance Safety Precautions, Their Origin and Necessity** ; OP 3347, **Ord-**

nance Safety Precautions USN ; OPNAVINST 3120.32, Equipment Tag-Out Procedures ; OPNAVINST 5100.19, Navy Safety Precautions for Forces Afloat: Chapter 2, Deck Seamanship and Chapter 12, Ordnance ; Federal Regulations 46 CFR Shipping ; and Ship Information Books (SIBs) and equipment manuals.

700-1.1.5 COMPLIANCE. Facilities aboard ship shall meet the requirements in the above-mentioned publications and this NSTM chapter. Any violation of a requirement in these publications or regulations shall be brought to the attention of NAVSEA unless it is known to have been waived by NAVSEA. No modification of ammunition handling equipment or rearrangement of this equipment shall be made without prior approval of NAVSEA. Appendix A lists documents that are for ammunition handling guidance only, except as stated above.

700-1.1.5.1 The following types of handling equipment shall not be used for direct handling (i.e., hold or lift the load) of ammunition (see Note 1):

- a. Vangs
- b. Block and tackles
- c. Tag lines
- d. Natural and synthetic fiber rope.

NOTE

This equipment may be used to control load sway or boom and davit rotation.

700-1.1.5.2 The following types of equipment shall not be used for Shipboard ammunition handling:

- a. Vertical package conveyor
- b. Gravity and belt conveyors
- c. Trolley hoists with friction wheel drive (traverse)
- d. Hoists with load limiters.

700-1.2 SAFETY PRECAUTIONS

700-1.2.1 GENERAL. Personnel operating or working in the vicinity of ammunition handling equipment shall always adhere to the safety precautions required by OPNAVINST 5100.19, NAVSEA OP 3347, OP 4 and OP 1014.

700-1.2.2 SPECIFIC PRECAUTIONS

- a. Ammunition shall be under positive physical restraint at all times during handling and stowage.
- b. Personnel shall not ride in or on ammunition handling equipment or other powered equipment, except where specifically designated (e.g., fork lift trucks).
- c. Personnel shall not place their head or other body parts into an ammunition handling trunk while the vertical conveyor is in operation.

- d. Personnel shall stand clear of both moving and suspended loads.
- e. Personnel shall not wear loose clothing that could become entangled in operating equipment.
- f. Communications shall be maintained between operating personnel at all levels and compartments involved in ammunition handling operations, to locate and assist in the correction of any problem that may occur.
- g. The two-man safety rule shall be adhered to at all times during vertical conveyor operation to ensure safe and proper conveyor operations. See **NSTM Chapter 572, Shipboard Stores and Provision Handling** for definitions and responsibilities pertaining to the two-man safety rule.
- h. Prior to performing maintenance, personnel shall ensure that equipment is secured and tagged in accordance with the ship's tag-out instruction (OPNAVINST 3120.32).
- i. Handling equipment shall not be used unless it has been visually inspected as being safe and has been load tested in accordance with paragraph 700-4.5.2.1.
- j. Handling equipment shall not be used to lift loads greater than its rated load except by direction of NAVSEA.
- k. Stowage and handling areas shall be kept clean and uncluttered.
- l. Safety devices, such as interlocks, overtravel cutoff switches and other electrical or mechanical safety devices, shall be maintained in working order and shall be used only as designated. Safety devices for equipment or systems shall not be altered except by direction of NAVSEA.

700-1.2.3 OTHER PRECAUTIONS. In addition to the safety precautions listed in paragraph 700-1.2, the precautions noted in **NSTM Chapter 300, Electric Plant-General** ; and in **NSTM Chapter 556, Hydraulic Equipment (Power Transmission and Control)** shall also be followed.

SECTION 2. DESCRIPTION

700-2.1 GENERAL

700-2.1.1 INTRODUCTION. This section contains general information on various types of equipment used for shipboard ammunition handling operations. Only general, descriptive information is included in this section. For more detailed information pertaining to specific equipment, consult the appropriate equipment technical manual or drawing.

700-2.1.2 AMMUNITION HANDLING EQUIPMENT. Ammunition handling equipment, as described in this manual, consists of the following: hoists, bridge cranes, dumbwaiters, elevators, conveyors, scuttles, underway replenishment gear and ammunition lifting equipment. This equipment is used in magazines; shops; on the deck; in trunks and passageways for loading, striking down or up, over-the-side handling or transferring to and from magazines; and loading, staging or receiving areas.

WARNING

When handling ammunition with handling equipment, safety must be the utmost concern and appropriate safety procedures must be followed at all times. Only trained personnel shall be permitted to operate this equipment.

Warning - precedes

Operators shall be familiar with emergency devices, understand their function(s) and know how to operate them.

700-2.2 HOISTS

700-2.2.1 WHIP HOIST. A hoist utilizing a single line to the hook without other intervening tackle ([Figure 700-2-1](#)). A whip hoist may be either motor-powered or manually operated. The hoist can be permanently mounted or portable.

700-2.2.1.1 Powered Whip Hoist System. A powered whip hoist system ([Figure 700-2-2](#)) consists of a skip box, suspended by a single hoist line (wire rope or chain) and powered by an electric or pneumatic motor. The hoisting machinery for the whip hoist can be mounted in a fixed position on a deck, bulkhead, overhead, davit, kingpost and boom or jib crane. The skip box is equipped with a slack cable safety device (see paragraph [700-4.5.6](#)) that grips the rails, tracks or guide wires if the hoisting line breaks. The slack cable device is not required for whip hoists that are used for over-the-side or emergency handling ammunition. The hoist is controlled by a hoist mounted rope or lever-operated control pendant or bulkhead mounted push buttons. To ensure safe operation, voice or phone communications between the levels served must be maintained.

700-2.2.1.2 Manual Whip Hoist. A manual whip hoist consists of a single part (line) purchase to a hook, powered with a manually-operated endless chain driven over a sprocket.

700-2.2.2 MANUALLY-OPERATED HOIST. This hoist ([Figure 700-2-1](#)) is operated manually by a lever or hand chain and is suspended by a hook or trolley. Manually operated chain hoists shall comply with MIL-H-904. Some of these hoists contain load limiters; these hoists shall not be procured for shipboard use. Existing hoists onboard ships which contain these limiters may be used if they are capable of being load tested in accordance with paragraph [700-4.5.2](#).

700-2.2.3 ELECTRIC AND PNEUMATIC CHAIN HOIST. An electric or pneumatic chain hoist consists of a high-speed chain block with a nonspooling chain, a reversible motor, a controller, and automatic stops mounted on a common frame ([Figure 700-2-1](#)). Automatic stops operate to shut off the power when the load hook reaches the upper or lower limit hook positions. Electric and pneumatic chain hoists may have an auxiliary hand drive for use in the event of power failure. Electric chain hoists shall comply with MIL-H-15317, pneumatic chain hoists shall comply with MIL-H-2813.

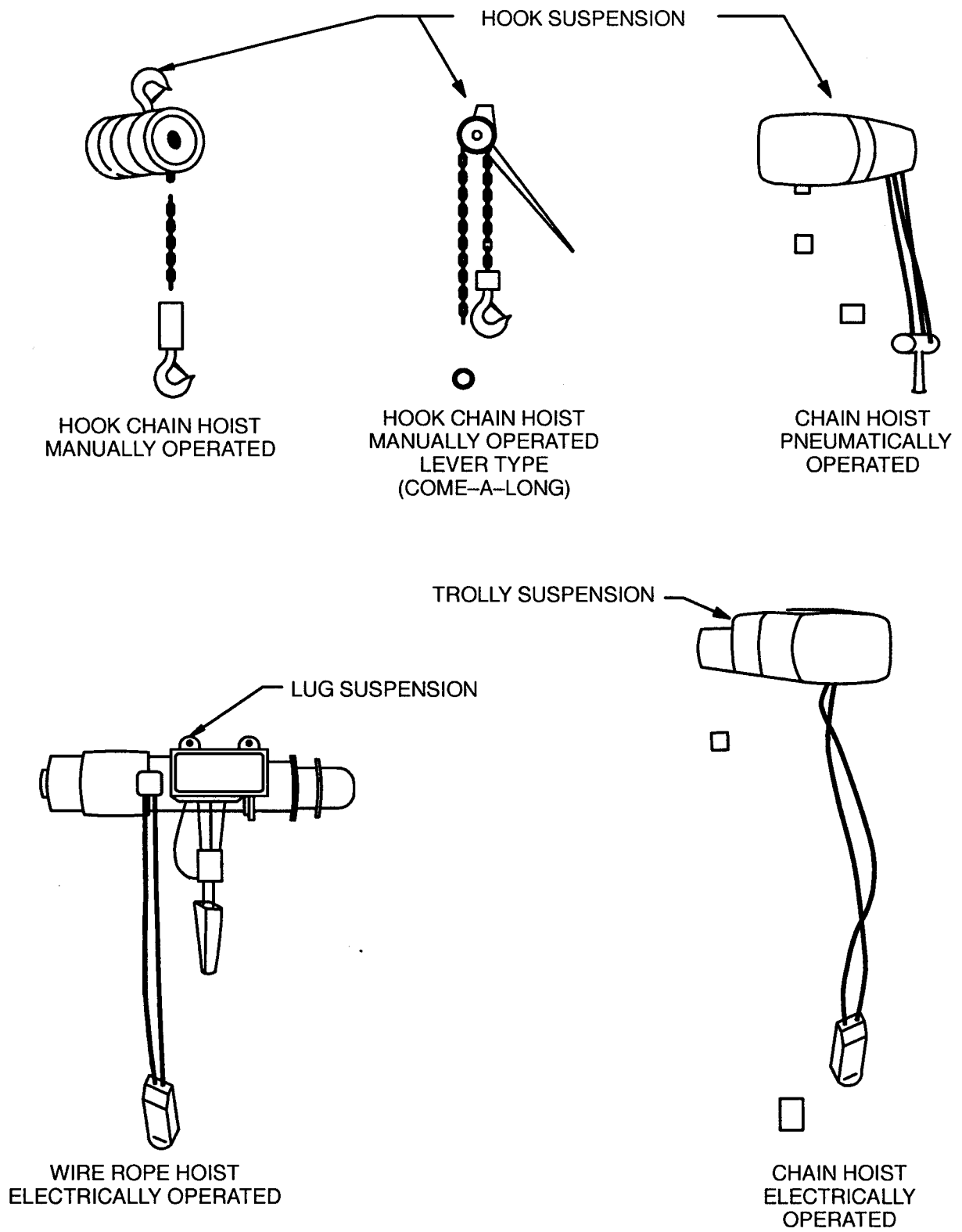


Figure 700-2-1. Hoists

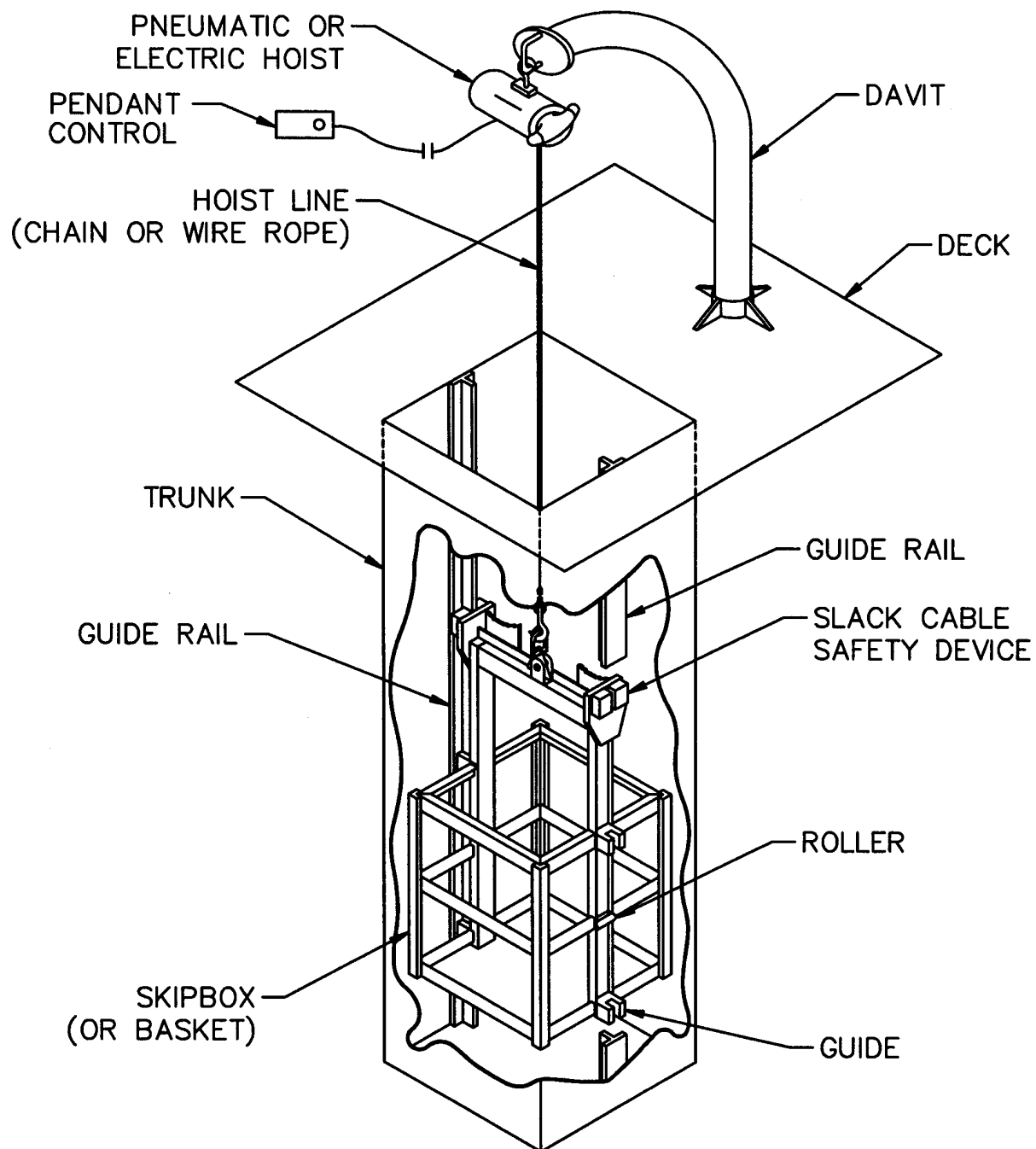


Figure 700-2-2. Powered Whip Hoist System

NOTE

An electric or pneumatic chain hoist may be used with a car or basket (skipbox) in a trunk similar to the whip hoist, except that in this case, it is portable and may be temporarily mounted on an overhead padeye or davit to align with a hatch or trunk.

These hoists may also be used outside a trunk to lift and transfer ammunition over the side of a ship. Handling equipment using guide rails within an enclosed trunk shall have a mechanical safety device to stop the platform or weapons basket in case of a wire rope or chain failure. This device is not required for emergency handling equipment.

700-2.2.4 ELECTRIC AND PNEUMATIC WIRE ROPE HOIST. Electric and pneumatic wire rope hoists are similar to electric and pneumatic chain hoists except that wire rope is used for the hoisting line in place of a chain ([Figure 700-2-1](#)). Wire rope hoists are normally larger than chain hoists of equal capacity due to the need for a spooling drum on which to store the wire rope. Electric wire rope hoists shall comply with MIL-H-15317, pneumatic wire rope hoists shall comply with MIL-H-2813.

700-2.2.4.1 Pneumatic Cylinder Hoist. A pneumatic cylinder is used to ram a sheave or sprocket vertically under a wire rope or roller chain which is fixed on one end and attached to a load platform at the other end. The cylinder extension results in vertical motion of the load platform proportional to the wire rope or roller chain Reeve. The load platform is guided by rails and is provided with a slack cable (rope) device ([Figure 700-2-3](#)).

700-2.2.4.2 Hydraulic Cylinder. A hydraulic cylinder may be used in the same manner as the pneumatic cylinder hoist described in [700-2.2.4.1](#) or it may be used to drive a load directly. In the direct mode, the free end of the system is equipped with adapters that interface with the ammunition to be moved or interface with the ordnance handling equipment attached to the ammunition.

700-2.2.5 HYDRAULIC HOIST. Hydraulic hoists are used on submarines to raise and lower shipping trays and hoist platforms for level changing. Designs use both the linear actuators (cylinders) and rotary actuators (motors).

700-2.2.6 TROLLEY HOIST. A trolley hoist consists of a trolley with wheels that run on overhead monorail or birail track systems or bridge crane systems. The trolley can either be manually or motor driven. A motor-powered trolley is moved by a rack and pinion, chain and sprocket, or friction wheel drive. (Friction wheel drive shall not be used for ammunition handling.)

700-2.2.6.1 Trolley hoists shall have some type of track clamp, brake or other type of locking device to hold the trolley positively in place when traversing is not desired (such as during hoisting).

700-2.2.6.2 The specifications for the hoist portion of trolley and tractor hoists are identical with those given for hoists in paragraph [700-2.2](#). The trolley and tractor are usually custom built and shall meet the requirements of the General Specifications or specific ship specifications for building ships for the United States Navy.

700-2.2.6.3 Where headroom and space are critical, very compact pneumatic trolley hoists shall be used that comply with MIL-H-24591 **Hoists, Chain, Pneumatic Low Headroom, Trolley Type** .

700-2.3 BRIDGE CRANE

700-2.3.1 A bridge crane, with its attached hoist, enables fore and aft, transverse, and up and down movement of a suspended load.

700-2.3.2 The bridge crane consists of a section of monorail or birail track suspended from fixed overhead rails by wheels which allow fore and aft movement of the track section along the fixed rails. A trolley and hoist assembly is suspended from the movable track by wheels, providing the transverse movement capability of the trolley and the lift capability of the hoist ([Figure 700-2-4](#)).

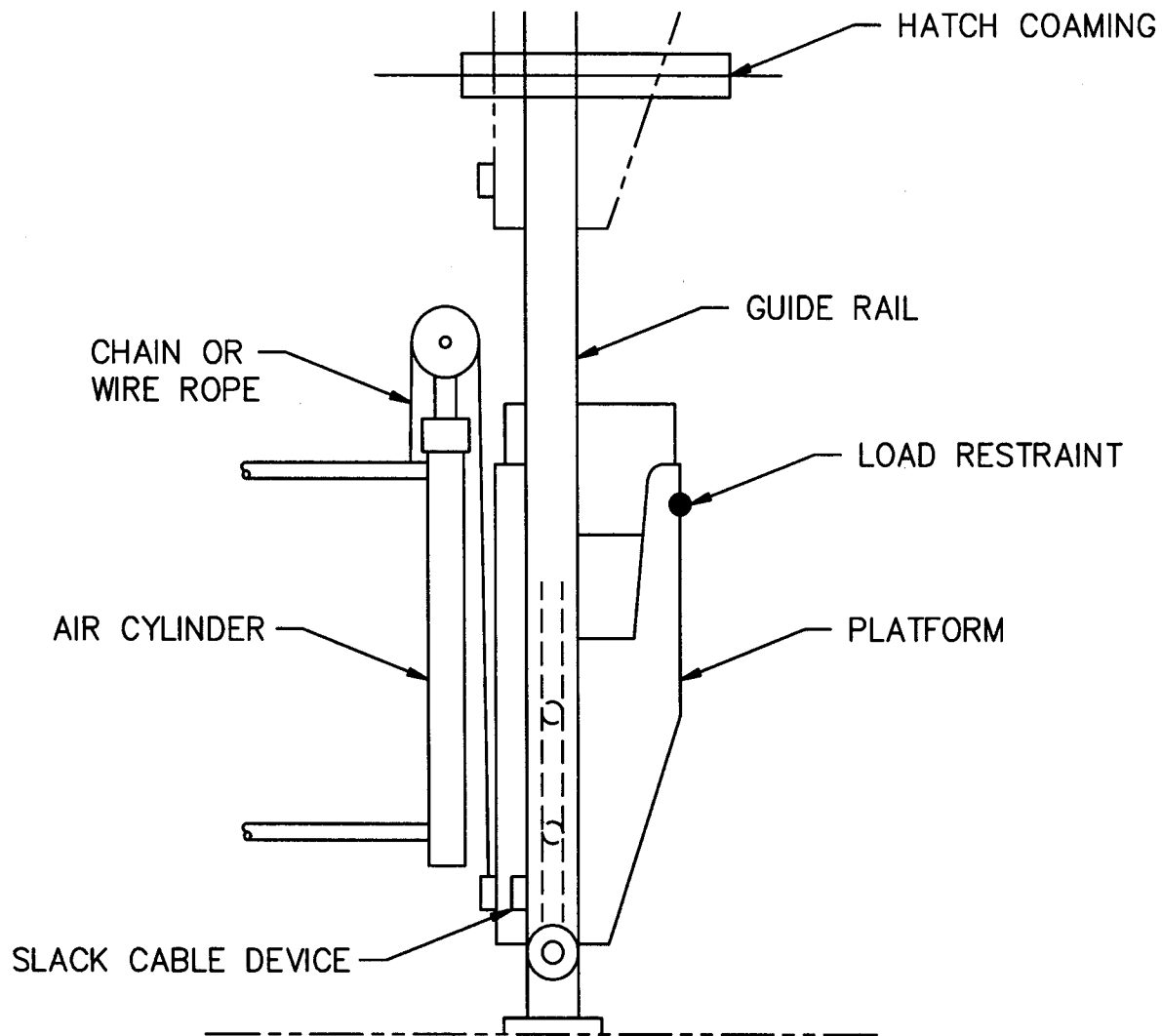


Figure 700-2-3. Pneumatic Cylinder Hoist

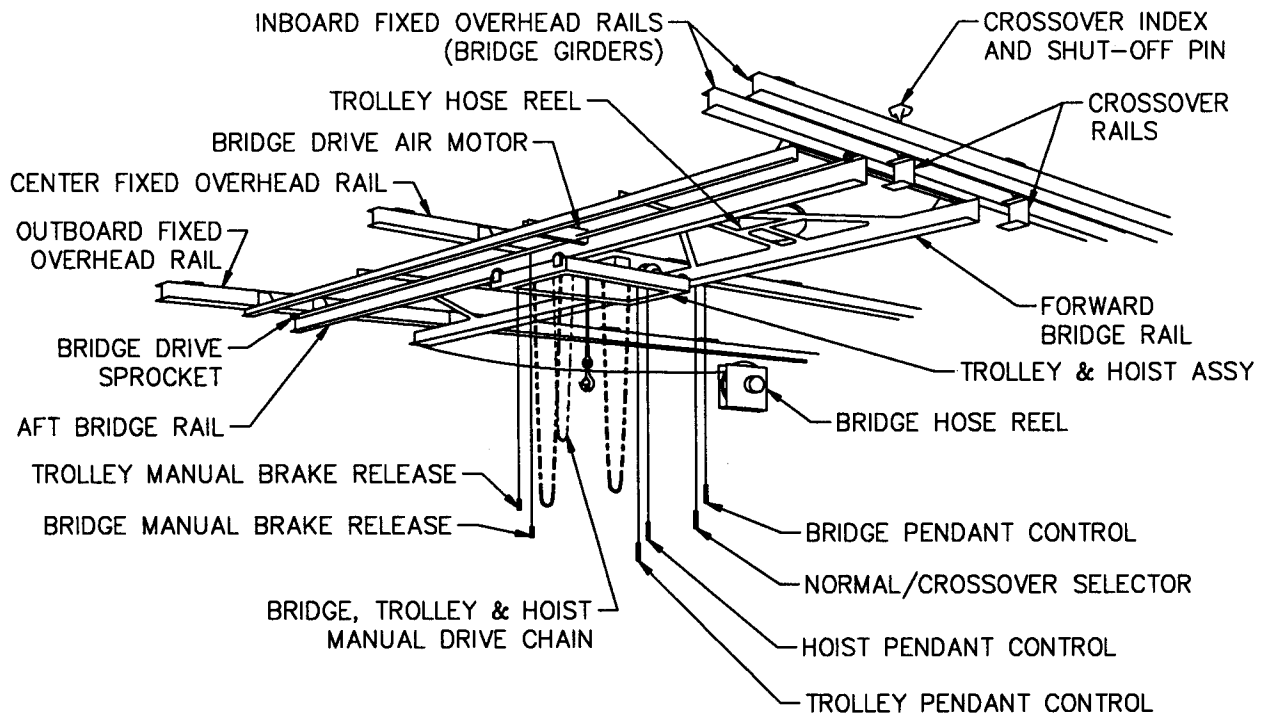


Figure 700-2-4. Pneumatic Bridge Crane and Trolley Hoist

700-2.3.3 The hoist, hoist trolley, and bridge may be electrically or pneumatically powered or manually operated. The drive for the bridge crane and hoist trolley may be by rack and pinion gear, chain and sprocket, or by friction wheel (friction wheel drive shall not be used for ammunition handling).

700-2.3.4 Automatic brakes, track clamps or other devices are used to prevent bridge and hoist trolley movements caused by ship motion. Mechanical and electrical track switches and control interlocks are used to position the bridge crane and to aid in hoist transfer from one bridge crane to another or to a fixed track system.

700-2.3.5 Bridge cranes are used for weapon handling primarily in magazine spaces where relatively large deck areas must be serviced. Use of bridge cranes allows greater flexibility in storing different types of ammunition; however, some loss of headroom results and more maintenance is required.

700-2.4 DUMBWAITER

700-2.4.1 GENERAL. A dumbwaiter ([Figure 700-2-5](#)) is a semi-automatic electromechanical hoist operating in a structural trunk. A single car carries varying weight ammunition between deck levels.

700-2.4.2 TYPE 1. The first type of dumbwaiter has a single car suspended from a single endless roller chain at the side of the trunk. The chain is supported at the top of the trunk by a drive sprocket and guided by an idler sprocket at the bottom. The top (upper) sprocket is powered by a drive unit mounted near the trunk top. The car is guided by guide shoes riding on guide tracks.

700-2.4.3 TYPE 2. A type two dumbwaiter has a single car inside a trunk. Guide shoes or rollers on guide rails hold the car in position. The car is raised and lowered by one or more hoist wire ropes that spool on a drum powered by a drive unit. The drive unit is normally mounted at the top of the trunk.

700-2.4.4 SAFETY DOORS. Dumbwaiter trunk openings are equipped with watertight doors and, in some cases, with flame-seal (fumetight) doors. When installed, the doors are interlocked to the drive control circuit to prevent dumbwaiter operation while the doors are open. These doors must be properly closed and dogged at all times when not in use because they become an integral part of the ship's damage control system by helping to prevent the spread of fire or flooding to magazine or stowage spaces.

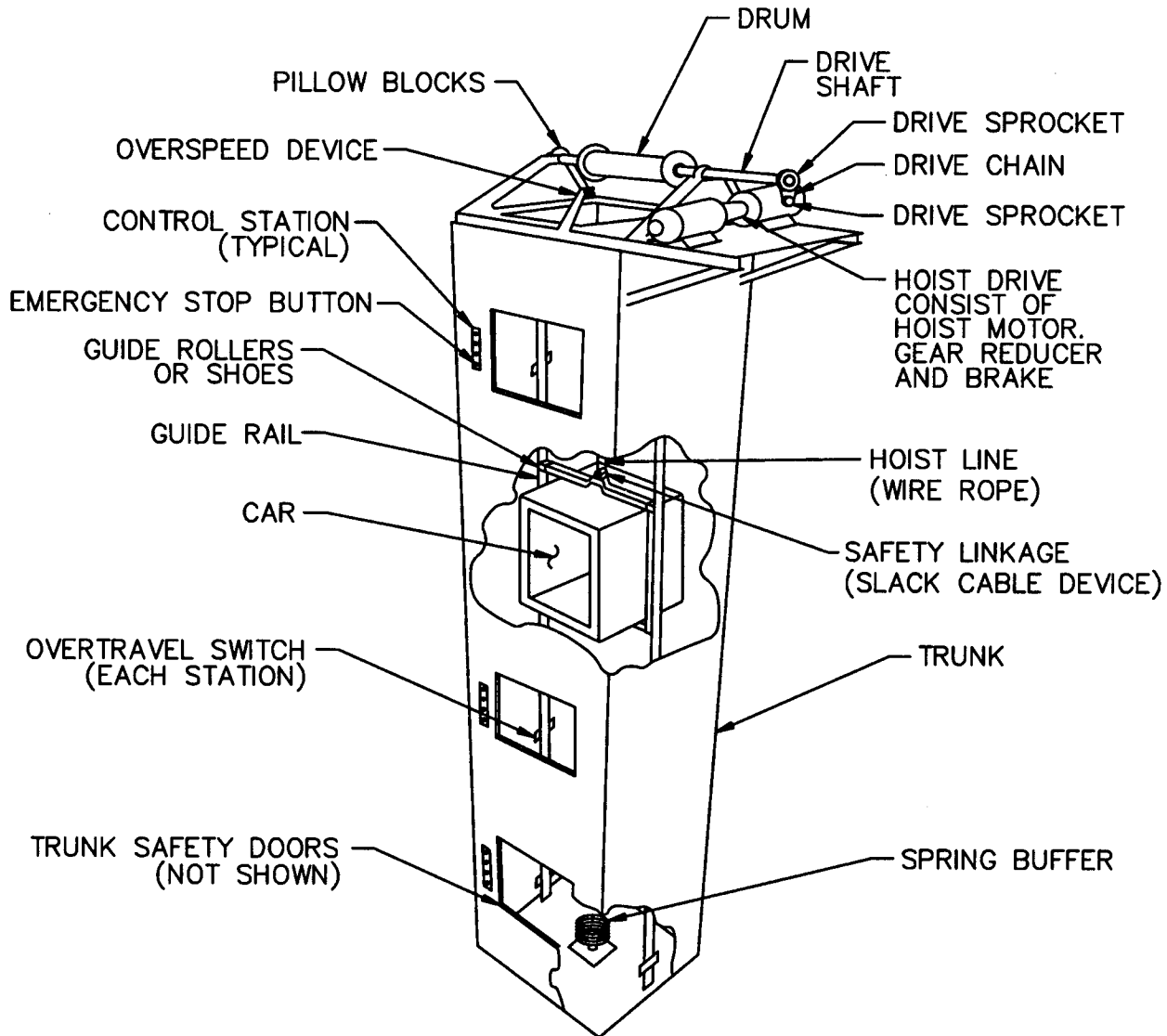


Figure 700-2-5. Dumbwaiter

700-2.4.5 CONTROL SYSTEM. The dumbwaiter control system is operated by means of pushbuttons that direct the dumbwaiter to each level served. Dumbwaiters can only be sent to a deck or level, they cannot be called for from another deck or level. The dumbwaiter is operable only when the trunk door(s) have been properly closed at all levels. Limit switches are used to automatically stop the car at the selected stations. Switches to pre-

vent jamming and to enable emergency stops are included in the control circuit. A slack cable safety device trips out the motor circuit, stopping the hoist if the hoist cables go slack. A second slack cable safety device prevents the dumbwaiter car from falling if the hoist chain or wire rope fails.

700-2.4.6 MANUAL OPERATION. The dumbwaiter car can be lowered manually in the event of a power failure or other emergency; the technique varies with each installation.

700-2.5 ELEVATORS

700-2.5.1 Ammunition, weapon or cargo elevators are used to vertically transport ammunition and cargo to and from magazine spaces, handling spaces or ship's holds to various decks in support of the ship's mission ([Figure 700-2-6](#)). In general, elevator classification is based on design and operational features, rather than on shipboard use or location. U.S. Navy shipboard elevators are either electromechanical or electrohydraulic. The typical elevator consists of a car or a platform hoisted on wire ropes driven by an electric motor and a spooling drum, or wire ropes driven by a hydraulic piston. There are also elevators that have platforms driven directly by a hydraulic piston or screw jack arrangement, however these have limited use. For complete information on elevator operation, maintenance and testing, including Level III System Operability Tests (SOT's), see **NSTM Chapter 772, Cargo and Weapons Elevators**, or your ship's individual elevator technical manual.

700-2.6 CARGO AND WEAPONS CONVEYORS

700-2.6.1 There are two types of vertical and horizontal conveyors, gravity or powered. Gravity, belt or vertical package conveyors shall not be used for ammunition handling. For these types of conveyors, see **NSTM Chapter 572**.

700-2.7 SCUTTLES

700-2.7.1 GENERAL. Ammunition passing scuttles are of two general types, rotating and flap ([Figure 700-2-7](#)). Scuttles are provided to prevent flames from passing along the ammunition supply route. The rotating type provides a continuous flame seal, whereas the flap type provides a seal only while the flap is closed.

700-2.7.2 ROTATING SCUTTLE. A rotating scuttle consists of a cylindrical cage rotating in a casing. The cage has one or more ammunition pockets and a limit switch ensuring that the opening in one side of the casing is closed by the cage before the opening in the other side of the casing is exposed to the ammunition pockets. The scuttle may be provided with a watertight cover and loading and receiving trays. The cage axis may be horizontal, vertical or inclined. Flame passage is arrested by the narrowness and length of the air gap between the cage and the casing, not by the cage rubbing against the casing.

700-2.7.3 FLAP SCUTTLE. A flap scuttle has a flap on one side and a watertight cover on the other side. The scuttle is used by latching the watertight cover in the open position and pushing the flap open with the ammunition.

700-2.8 UNDERWAY REPLENISHMENT GEAR

700-2.8.1 This gear is described in S9570-AD-CAT-010, **Underway Replenishment Hardware and Equipment Manual** and S9571-AA-MMA-010, **Underway Weapon Replenishment Ordnance Handling Equipment and**

Transfer Units . Operating procedures are given in NWP-14 (Naval Warfare Publication), **Replenishment at Sea Manual** . For further information see **NSTM Chapter 571** .

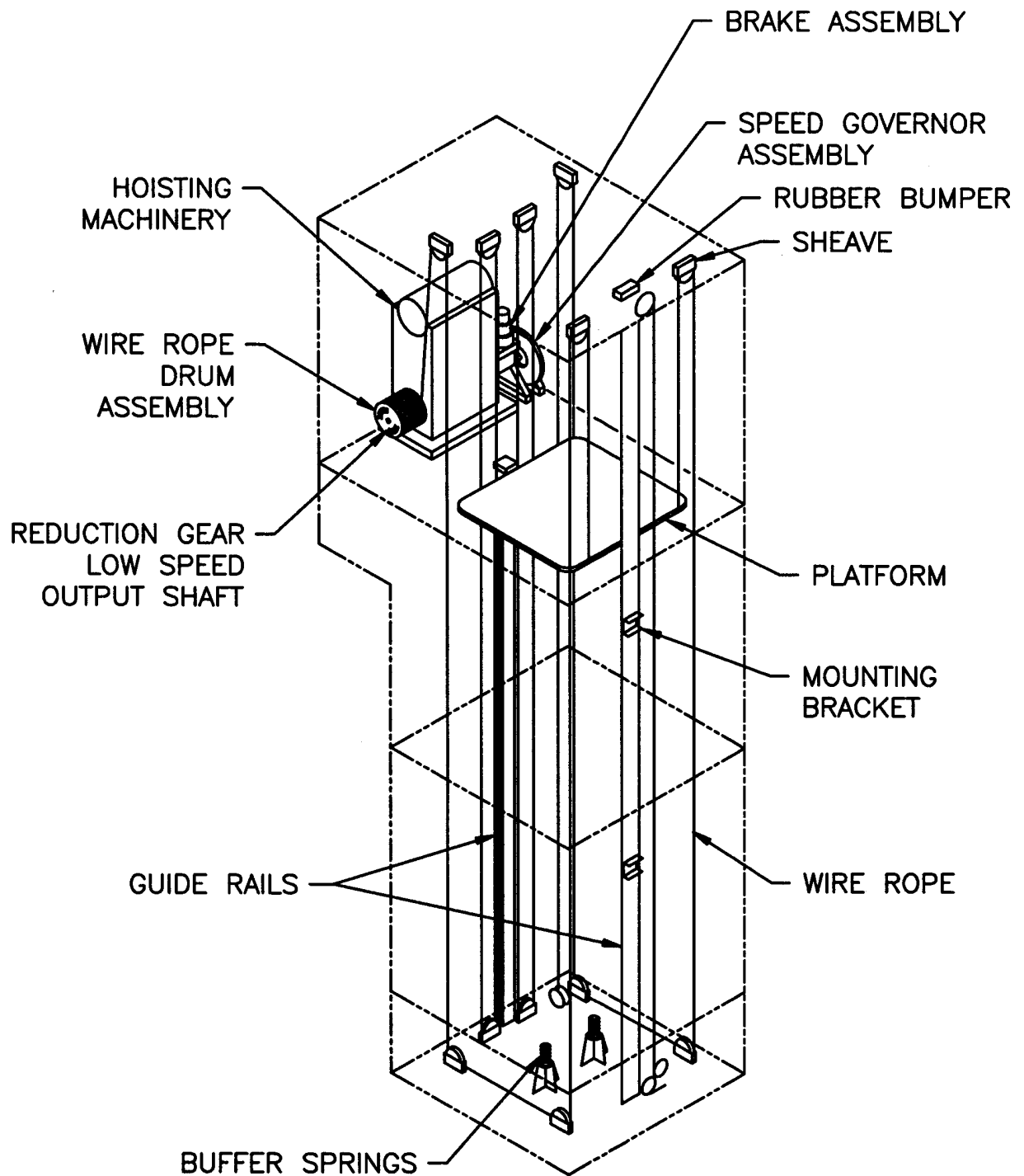


Figure 700-2-6. Typical Elevator for Surface Combatant Ships

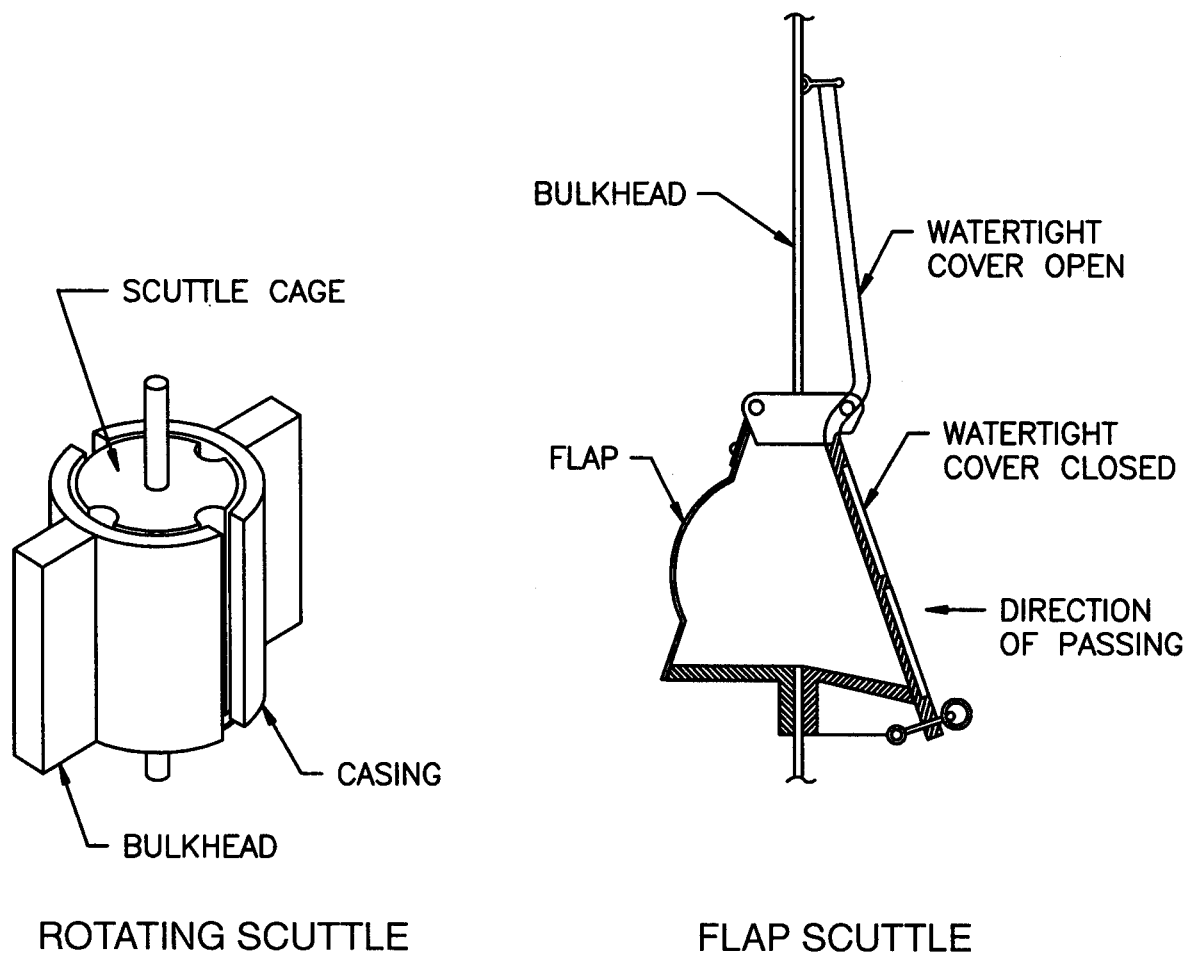


Figure 700-2-7. Passing Scuttles

700-2.9 AMMUNITION LIFTING EQUIPMENT

700-2.9.1 Specific ammunition lifting equipment, such as slings, strongbacks, adapters, carriers and bands, are described in NAVSEA OP 2173 (Vol. I and Vol. II), **Approved Handling Equipment for Weapons and Explosives**, and in NAVSEA SG420-AP-MMA-010, **Periodic Testing Arrangements for Ordnance Handling Equipment**. The requirements of **NSTM Chapter 700** apply to any ammunition lifting equipment not described in these manuals.

700-2.10 ASSOCIATED AMMUNITION HANDLING EQUIPMENT

700-2.10.1 **MONORAIL AND BIRAIL TRACKS.** Monorail and birail tracks are installed in some magazines, tender workshops, mess decks and weapons transfer areas for use with bridge cranes and trolley hoists for handling ammunition. These tracks are considered to be ammunition handling equipment.

700-2.10.2 **PADEYES AND SHACKLES.** Padeyes installed in ammunition handling areas, as well as shackles used with ammunition handling equipment, are also considered to be ammunition handling equipment.

700-2.10.3 KINGPOST AND BOOM. A kingpost and boom (Figure 700-2-8) is used where the outreach required is greater than feasible with a davit. This system is normally portable, consisting of the kingpost, backstays, topping swivel, boom, boom swivel, hoist, vang, deck cleats and reversible padeyes (baxter bolts) and tag lines. Refer to ship's installation blueprints for proper setup.

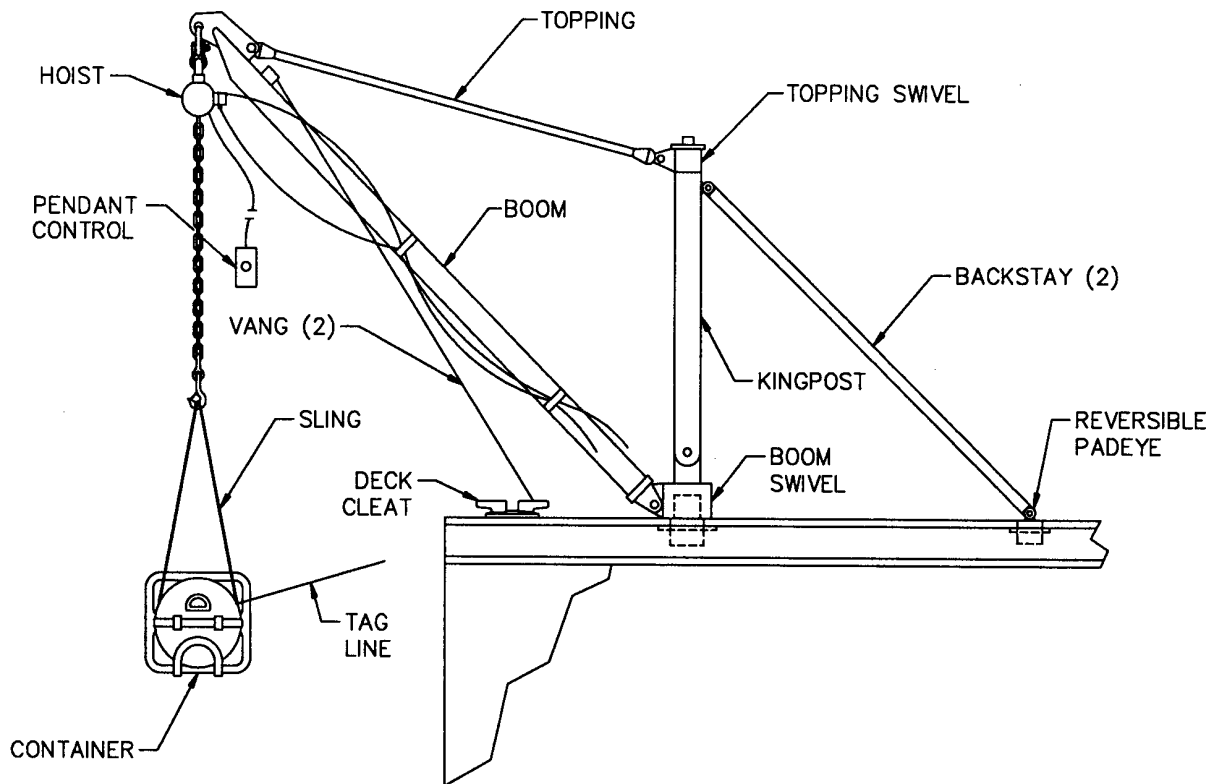


Figure 700-2-8. Kingpost and Boom

700-2.10.4 J-DAVIT. A post curved at the top (J-davit) provides an outreach position for the attachment of a hoist. The post is set in a davit socket that can be fixed or portable. If the post is required to rotate, the socket is provided with a bearing and a pin to lock the davit in the working and stow position. Vangs and cleats are provided to rotate the davit. Standard J-davit design is provided in BUSHIPS drawing no. 805-1645271.

700-2.11 GLOSSARY

700-2.11.1 Definitions are provided for terms directly associated with ammunition handling and stowage, and for terms having a specific meaning within this chapter.

Ammunition. Ammunition includes any item or component that contains conventional or nuclear explosives, propellants, pyrotechnics or chemical agents. This includes bombs, torpedoes, and warheads and missiles; including simulated configuration ammunition.

Ammunition Handling Equipment.

All equipment used to transfer or transport ammunition; such as cranes, hoists, elevators, handtrucks, etc.

Ammunition Lifting Equipment.

Devices such as beams, carriers, hoisters, links, strongbacks, slings and other equipment that provides an interface between the item (load) being raised, lowered or traversed and the prime handling equipment.

Backstay. A member supporting the backside of a kingpost (Figure 700-2-8).

Block, Load Hoisting.

The hook, sheaves, sprockets, bearings, pins and frame assembly suspended from the load chain or wire rope.

Boom. An inclined or horizontal spar, strut or other long member supporting the hoisting mechanism (Figure 700-2-8).

Brake. A device (drum or disc) used to slow and stop elevator platform motion by the friction between a rotor and discs, or between linings and a drum.

Caution. Identifies an operating or maintenance procedure, practice, condition or statement that, if not strictly observed, may result in damage to or destruction of equipment or loss of mission effectiveness.

Clevis. A device used on some hoists in place of a load hook (Figure 700-2-9).

Davit. A steel structure usually J-shaped (Figure 700-2-2), used to suspend hoist.

Drum. A grooved cylinder that is part of a hoisting device on which wire rope is wound (Figure 700-2-3).

Dynamic Load Test.

A load test conducted at 150 percent of rated load, at maximum attainable speed through the complete operating range of the equipment. This tests the ability of equipment to operate with rated load under dynamic conditions of ship motion.

Dynamometer. A load measuring or sensing device, installed to accurately determine the weight (force) of the load and associated impact loads; may be installed as an integral component in the rigging or attached between the hook and the load.

Eyebolt. An eye (loop)-shaped device with a threaded shank. Similar use as a Padeye. Some eyebolts are reversible (Baxter bolts) and are mounted in threaded deck sockets.

Hook Safety Latch.

A device used to bridge the throat opening of a hook to prevent slings and lifting devices from inadvertently slipping off the hook.

WARNING

All hooks shall have safety latches in place or be moused when handling a load to prevent inadvertent load release and potential injury to personnel.

Hoist, Whip. A hoist utilizing a single line to the hook. A skipbox, sling, or beam attached to the hook is normally used to support the load (Figure 700-2-1, Figure 700-2-2, and Figure 700-2-8).

Hoist Line. A chain or wire rope used to support the load (Figure 700-2-2).

- Interlock. A protective device to prevent the operation of equipment or a sequence of action of systems, components or a component part.
- Kingpost. A vertical member used to support a boom ([Figure 700-2-8](#)).
- Lift. The vertical distance of hook travel or a load being lifted.
- Limited Test. A test in accordance with [700-4.5.2.2](#) where all the test requirements cannot be satisfied.
- Load Bearing Components.
Those components of the handling equipment which supports the load or are stressed while lifting or holding a load. Examples include brakes, structure, load chain or wire rope, sprockets, sheaves, hooks, motors, shafts, clutches, gears, couplings and bearings.
- Loading Tray. A device used to aid in loading the torpedo tubes.
- Load Controlling Components.
Those components of the weight-handling equipment that position, restrain or control movement of the load; and in which a failure or malfunction could cause dropping, or uncontrolled shifting or movement of the load.

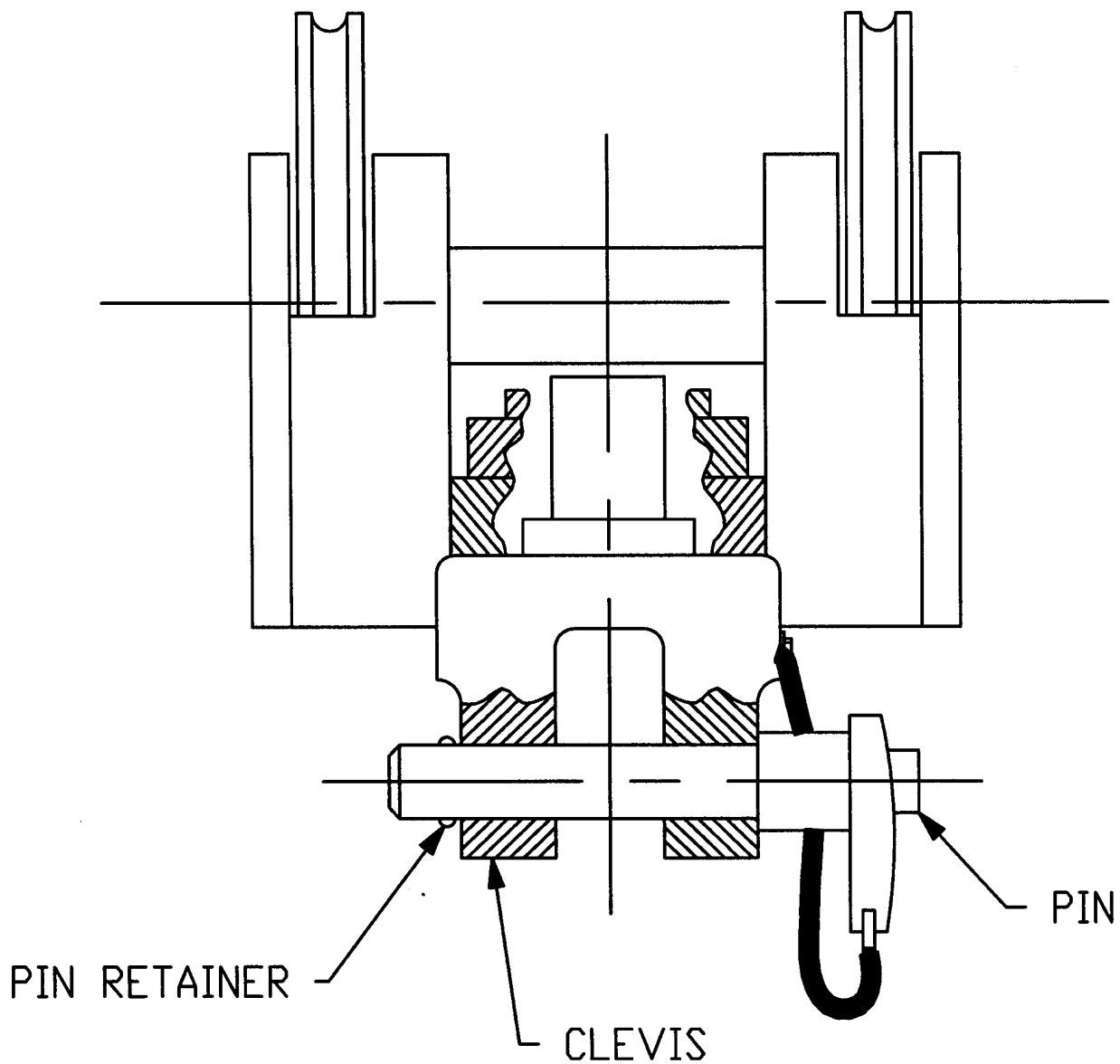


Figure 700-2-9. Load Clevis

- Load Limiter.** A mechanical device contained in some hoists which prevents the hoist from lifting too great an overload (usually set at about 125 percent of rated load). Load limiters shall not be used onboard Navy ships.
- Load Platform.** A rail-guided platform that supports the load in an elevator or hoist system.
- Locker.** A lockable storage space, cabinet or box that is either built into the ship structure, attached to the deck or bulkhead for stowage of ordnance material, equipment, ammunition, explosives or pyrotechnics.
- Mousing.** A wrapping of rope, yarn, string or wire around the shank end and point of a hook to prevent slings or lifting devices from inadvertently slipping off the hook.

MRC.	Maintenance Requirement Card.
Manual Operation.	Hand (or foot) operation of equipment.
No-Load Test.	A test by which the hoist or crane's functional performance, without a load on the hook, is evaluated.
NDT (Nondestructive Testing).	A testing method applied to structural materials in order to detect structural flaws or defects. Uses such techniques as ultrasonic, magnetic particle, liquid penetrant or radiographic inspection that does not structurally affect the test object.
Non-Powered Handling Equipment.	Equipment, such as slings, beams, strongbacks and adapters, that are not electric, pneumatic or hydraulic powered (see ammunition lifting equipment).
Note.	An essential operating or maintenance procedure, condition or statement that needs to be emphasized.
Overload.	Load greater than the device is designed to handle (i.e., greater than rated load).
Padeye.	A fitting having one or more eyes and mounted in the overhead, on a bulkhead or deck, or attached to a davit or boom. Padeyes are used to suspend a hoist or other handling equipment.
Pendant (Control).	A pushbutton or lever-operated control unit (station) suspended from a hoist, trolley or bridge crane, enabling the equipment to be operated from the deck (Figure 700-2-1 , Figure 700-2-2 , Figure 700-2-4 and Figure 700-2-8).
PMS.	Planned Maintenance System.
Powered Handling Equipment.	Ammunition handling equipment (electric, pneumatic or hydraulic driven) that moves or transports a load.
PQS.	Personnel Qualification Standards.
Rails.	The track over which wheel trucks for the crane or trolley travel, supported by the deck, runway beams (overhead) or bridge girders (Figure 700-2-4). Guide rails are also used to guide skipbox and elevator platforms.
Rated Load.	The maximum permissible weight handling equipment is designed to carry during use (also called Safe Working Load).
Rated Load Test.	A test conducted at 100 percent of the rated load, at no less than rated speed, through the complete range of operating motions (hoist, lower, top, rotate and travel), including testing of brakes and emergency features, throughout 10 cycles. The test is performed to determine the operational condition of equipment, repeatability of functions, and heat dissipation ability.
Safe Working Load.	See Rated Load.
Sheave.	A wheel with a circumferential groove designed to contain a specific size of wire rope and used to change the direction of a running wire rope (also called Pulley).
Side Load.	The horizontal component of the hoist load force acting on the structure when the hoist chains or ropes are not operating in a vertical line (also called Side Pull).
Skipbox.	A load platform, basket, car or container attached to a hoist into which the load is placed. It is usually used as a component of a whip hoist system and guided by rails or tensioned guide wires (Figure 700-2-2).

Slack Cable or Chain Safety Device.

A mechanical device, installed between the platform or skip box and the guide rails, designed to apply a braking device against the guide rail to stop the platform or skip box when the hoist wire rope or chain slacks or breaks (Figure 700-2-2).

Slip Clutch. Same as Load Limiter.

Sprocket. A wheel with pockets or teeth designed to fit the links of a chain. The sprocket can drive the hoist load chain or traverse a hoist along a chain attached to a trolley rail.

Static Load Test.

A motionless load test normally conducted at 200 percent of the rated load and performed by suspending the required load for a period of 10 minutes. This test is performed to determine the structural and mechanical integrity of the equipment components.

Strength Welds.

Those welds, in structural members, whose failure could cause dropping, uncontrolled shifting or adverse movement of the load.

Suspension Hook.

A hook on top of a hoist used to suspend the hoist.

Test Load. Any load, weight or force of known magnitude, maintained within a specified tolerance, used for static, dynamic or rated load testing.

Topping Line. A line used to support a boom (Figure 700-2-8).

Track Clamp. A device which grips the rail or track to hold a hoist trolley in position while hoisting or lowering a load. A safety device which grips the guide rails to prevent a whip hoist basket or load platform from dropping if the load chain or wire rope becomes slack or breaks.

Tram Points. Points inscribed on the side of a hook from which measurements can be taken at a later time to determine if the hook throat opening has increased.

Vang Lines. The lines used to rotate a boom or davit. These lines may be run through a block (Figure 700-2-8).

Warning. An operating or maintenance procedure, practice, condition or statement that, if not strictly observed, may result in injury or death of personnel.

SECTION 3.

OPERATIONAL AND MAINTENANCE GUIDE

700-3.1 INTRODUCTION

700-3.1.1 This section contains requirements, instructions and information needed in the operation and maintenance of various types of shipboard ammunition handling equipment. Only general information considered essential to shipboard ammunition handling is included. Review the appropriate technical manuals for detailed information regarding operation and maintenance. If the Planned Maintenance System (PMS) is installed, preventive and corrective maintenance shall be conducted in accordance with applicable Maintenance Requirement Cards (MRC's).

700-3.2 HOIST OPERATIONS

WARNING

To avoid injury to personnel or damage to equipment, all safety precautions must be observed during hoist operations.

WARNING

Only non-sparking type of handling equipment shall be used to handle black or smokeless powder. Only non-sparking types of equipment shall be used in black or smokeless powder stowage areas. Either type of powder can be ignited with a spark.

NOTE

Hoists with non-sparking chain are not required except as stated in the above warning.

700-3.2.1 GENERAL. Operating instructions and safety precautions shall be posted at or near all equipment controls. Frequent examination and periodic inspection of the equipment, as well as conscientious observance of safety rules, may save lives as well as time and money. Operation and maintenance personnel should complete the applicable PQS prior to operating or maintaining the assigned equipment.

700-3.2.1.1 Read and follow manufacturer's instructions and maintenance manuals for hoist operation or repair. When repairing or performing maintenance on a hoist, use only the manufacturer's recommended parts and materials. Refer to section [700-4.5.2.2](#) to determine what testing is required following a maintenance action.

700-3.2.1.2 Read and follow all instructions, cautions and warning information on, or attached to, a hoist. Note rated load (capacity) of the hoist and never exceed it. Ensure hoist has been load tested within the last four years.

700-3.2.2 SAFE HOIST OPERATIONS. The potential dangers inherent in the operation of hoists cannot be over emphasized. For the safety of all concerned, it is imperative that all personnel operating hoist equipment understand and comply with the following requirements:

700-3.2.2.1 Before Operating the Hoist. (First time each shift)

700-3.2.2.1.1 Examine the hoist and all associated handling equipment; including chain guides, sheaves, sprockets, chain guide fasteners, track clamps and hooks for damaged, loosened or missing parts.

700-3.2.2.1.2 Visually inspect the wire rope or chain. Check for improper seating, twisting, kinking, wear or other physical damage. Check for signs of deterioration or damage that could indicate a loss of strength or load

capability. If any defects are found, conduct a detailed inspection in accordance with applicable paragraphs in paragraph [700-4.3](#) for wire ropes and chain. Ensure load chain is not twisted or flipped through (see [Figure 700-3-1](#)).

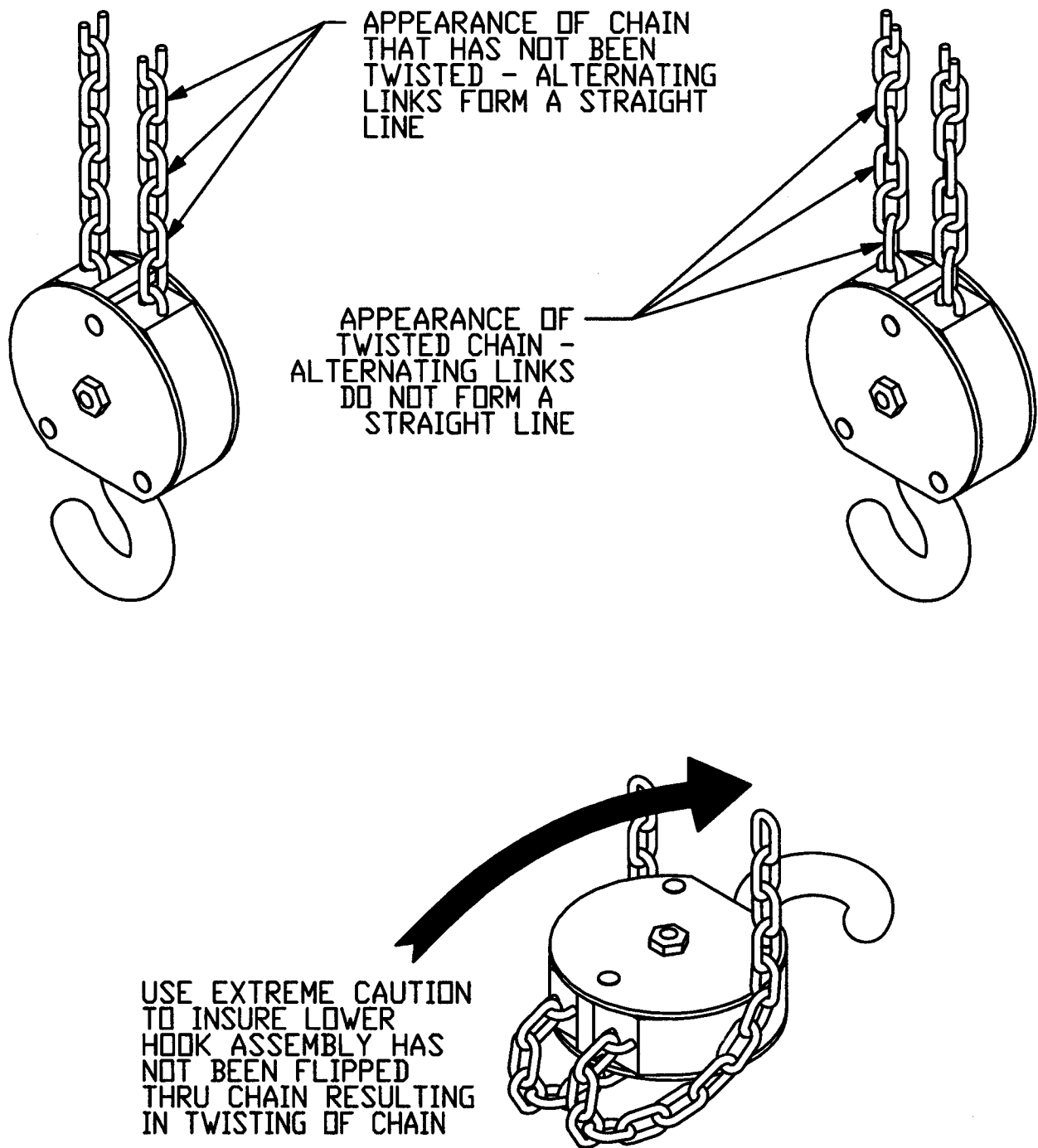


Figure 700-3-1. Inspection for Twisted Chains

700-3.2.2.1.3 Check for misaligned trolley wheels, axles or tracks.

700-3.2.2.1.4 Before operating, ensure air lines for pneumatic hoists are free of moisture. Drain air strainer or filter, if provided, in accordance with PMS pre-operation cards.

700-3.2.3 OPERATIONAL CHECKS. Prior to handling ammunition (first time each shift), OPERATE power-driven equipment through, at least, one operational cycle with either a no-load or dummy ammunition load to ensure proper operation of controls, brakes, track clamps and safety interlocks. Adjust brakes if required. Improperly adjusted brakes can cause hoist to run at reduced speed, overheat and cause smoke.

700-3.2.4 OPERATION OF HOIST WITH LOAD

700-3.2.4.1 Before operating, center hoist over the load.

700-3.2.4.2 Ensure load attachment (strongback, sling, etc.) is properly seated in the saddle of the hook. Balance load properly before handling, avoid placing a load on tip of a hook and ensure hook has safety latch or is moused before lifting a load.

700-3.2.4.3 Slowly take up slack in load chain or rope.

700-3.2.4.4 Pull load up in a straight line so that neither hoist body, load chain, nor rope are angled around any object.

700-3.2.4.5 When raising, lowering or traversing the hoist, ensure load clears neighboring ammunition, machinery or other obstructions. Keep load close to the deck, never lifting it higher than needed to clear obstruction.

700-3.2.4.6 Avoid swinging load or load hook when traversing the hoist.

700-3.2.4.7 If unusual performance or visible defects (such as peculiar noise, jerky operation, movement in the wrong direction or obviously damaged parts) are noticed, remove the hoist from service and thoroughly examine and repair as necessary.

700-3.2.4.8 Inspect track position and track alignment when transferring trolley hoist from one track system to another. If practical, keep portable track sections in place at all times. When not in use, place them only in their designated stowage.

700-3.2.4.9 Release lever gradually on lever-operated hoists when under a load to avoid a flying handle.

700-3.2.5 AFTER HOIST USE

700-3.2.5.1 Secure hoist in stowage position.

700-3.2.5.2 Inspect hoist for defects, including the track clamps and other braking or locking devices, and for proper operation and condition. Remove the hoist from service if any defects are found that cannot be immediately repaired.

700-3.2.5.3 Keep oil off brake linings or disks. Stow portable hoists in an upright position to prevent oil in the internal lubricator from running onto the brake lining.

700-3.2.5.4 Place covers, if applicable, on hoists and stow deflectors, portable track sections or devices which are used during ammunition handling operations in their designated stowage when they are not in use.

700-3.2.6 MAINTENANCE. Maintain all hoists and associated equipment (hooks, ropes, chains, brakes, limit switches, chain guides and guide fasteners) in accordance with PMS. Where PMS has not been provided, submit PMS feedback reports and establish a regular inspection schedule. Maintain records until PMS is provided.

700-3.2.7 UNSAFE HOIST OPERATION PRACTICES. Although hoists are beneficial devices, precautions shall be taken to avoid practices that are dangerous to personnel and equipment. The following is a list of actions to avoid when working with a hoist:

700-3.2.7.1 Do not use a defective hoist.

700-3.2.7.2 Do not use any hoist that has not been load tested in accordance with paragraph [700-4.5.2.1](#).

700-3.2.7.3 Do not allow unqualified personnel to operate a hoist.

700-3.2.7.4 Do not allow personnel who are not physically fit or mentally alert to operate a hoist.

700-3.2.7.5 Never lift or transport a load until all personnel are clear of the area.

700-3.2.7.6 Never pick up a load greater than the rated load capacity marked on the hoist label plate or other system component such as the davit, except when conducting periodic load tests.

CAUTION

Overloading can be caused by ship motion or jerking, as well as by static overload.

700-3.2.7.7 Never lift a load without a safety latch or mousing on the hook.

700-3.2.7.8 Never carry personnel with the hoist.

700-3.2.7.9 Do not operate hoist to extreme limits of chain or rope.

700-3.2.7.10 Do not operate hoist so that it strikes other hoists or end stops.

700-3.2.7.11 Never use a hoist rope or chain as a sling.

700-3.2.7.12 Never leave a suspended load unattended.

700-3.2.7.13 Do not divert your attention from the suspended load while operating a hoist.

700-3.2.7.14 Do not attempt to lengthen or repair the load chain.

700-3.2.7.15 Ammunition shall only be handled with approved equipment. Ammunition handling equipment may be used to handle non-ammunition items providing they are weight marked or of known weight and do not exceed the rated load of the handling equipment. Non-ammunition items shall be handled separately and not concurrently with ammunition. Use of ammunition handling equipment for non-ammunition items handling must be approved by the department head responsible for the equipment.

700-3.2.7.16 Do not throttle the pneumatic hoist air motor to hold a load suspended.

700-3.2.7.17 Do not stow material in ammunition hoist trunks.

700-3.2.7.18 Do not use a hoist which contains a load limiter for handling ammunition.

700-3.3 MAINTENANCE OVERVIEW

700-3.3.1 PLANNED MAINTENANCE SYSTEM (PMS). PMS shall be accomplished in accordance with instructions provided on applicable MRC's. If MRC's do not exist for a particular piece of equipment, coverage shall be requested by submission of a PMS feedback report. As an interim measure until PMS coverage is provided, the using activity shall develop a temporary program that includes periodic equipment lubrication, adjustment, inspection and testing in accordance with the maintenance information provided in the equipment technical manual and in this chapter. All parts subject to wear shall be inspected at regular intervals. All parts that are damaged or that operate in a manner creating an unsafe condition, shall be repaired or replaced. Existing MRC's that do not meet the requirements stated herein shall be reported on a PMS Technical Feedback Report, OPNAV Form 4790/7B.

700-3.3.2 MAINTENANCE GUIDELINES. Only qualified personnel shall perform maintenance on hoisting equipment; making use of staging, a telescoping platform and a boatswain's chair or lifts, as needed, to provide working access to the components requiring maintenance.

700-3.3.3 PRE-MAINTENANCE PROCEDURES. Prior to performing any maintenance on hoisting equipment, the appropriate equipment technical manuals and PMS procedures shall be reviewed. Before beginning maintenance work, remove any load and secure the hoist in its stowed position. In addition, the pneumatic, hydraulic and/or electric power circuit for hoisting equipment shall be rendered inoperative and suitable danger tagouts shall be attached to station controls.

700-3.3.4 TAGOUT PROCEDURE. Dumbwaiters and hoists shall be tagged-out in accordance with OPNAVINST 3120.32 and Type Commander's (TYCOMs) tagout instructions. Signs stating DO NOT OPER-

ATE, in letters at least 2 inches high, shall be placed on dumbwaiter or hoist trunks in the vicinity of loading and discharge openings. All trunk doors shall have a means for being secured, and shall be secured against unauthorized openings.

700-3.3.5 LUBRICATION. A light film of oil, MIL-L-17331 SYM 2190 TEP, NSN 9150-00-235-9061 shall be maintained on load chain surfaces to prolong chain life. Other lubrication requirements shall be in accordance with PMS and the maintenance manuals furnished with the equipment. Lubricants must never be allowed to get on the brake shoes.

700-3.3.6 COUPLINGS AND CLUTCHES. Before each shift's use, shaft friction couplings and clutches shall be visually examined.

700-3.3.7 PROCUREMENT OF HOISTS OR PARTS. When requests are submitted for new or replacement hoists (or for repair parts for those in service), care shall be taken to give all information available, such as name of manufacturer, capacity, catalog number, part number in catalog, type, track size, minimum lift height, available current and voltage, lift speed(s), overhead height, and clearance requirements for low headroom hoists. Procurement requests for hoists that are in compliance with military specifications must include specific ordering data defined in those specifications. Hoists with load limiters shall not be procured for shipboard use. Existing hoists may be substituted if periodic load tests can be accomplished.

700-3.4 PREVENTIVE HOIST MAINTENANCE (INDIVIDUAL EQUIPMENT)

700-3.4.1 WHIP HOISTS. Once each quarter, examine the whip hoist load line (wire rope or chain), slack cable device, broken cable device and brakes for damage, wear or looseness. Examine the guide rails and rollers or shoes for wear, proper lubrication and proper alignment of rail joints and for minimum gap size between rail sections. Check limit stops for proper operation.

700-3.4.2 ELECTRIC HOIST. Before first use of each shift, examine the electric cables on portable electric hoists for wear, kinks or defective insulation. Ensure that electrical connectors have a protective ground circuit.

700-3.4.3 TROLLEY HOISTS. Once each quarter or before first use of the shift, examine the trolley wheels for binding, flat spots and full-rolling contact with the track rail. Lubricate the trolley wheels to ensure free turning on their axles. Inspect the hoist connection to the trolley for looseness. Check to ensure that the load equalizing pin is securely attached between the trolley side frames, the drive wheel or sprocket provides traction for trolley motion, and the trolley track clamp resists trolley motion. Examine the fittings supporting the trolley tracks for looseness.

700-3.4.4 CHAIN/WIRE ROPE EXAMINATION. Once each quarter or before first use of the shift, examine the wire rope or chain load line for wear, flat spots, kinks, broken wire in the wire rope, or deformed or elongated chain links.

700-3.4.5 HOOK EXAMINATION. Before first use of each shift examine hooks for visible deformation and cracks or for damaged safety latches. Load hooks and chain shall be kept free of paint.

CAUTION

Repair of hooks is not authorized.

700-3.4.6 PNEUMATIC HOISTS. In cases where pneumatic hoists are used in freezing temperatures, ethylene glycol antifreeze (FED Spec O-A 548) may be used in place of normal lubricants (used in in-line lubricators) only while operating hoists outside. The glycol prevents ice from forming in the air lines and acts as a lubricant and corrosion preventive agent.

WARNING

Inhalation of ethylene glycol vapor is hazardous to health. Ethylene glycol shall not be used when hoist is operated inside the ship.

700-3.4.7 HYDRAULIC HOISTS. Before each use, examine the overhead hydraulic hoist wire ropes and end fittings or hooks. Wire ropes shall be inspected for corrosion, wear, broken wires and permanent distortion, such as kinking. End fittings and sockets shall be inspected for indications of wire rope slippage, wear, deformation, and damage. For information and maintenance instructions, see **NSTM Chapter 556, Hydraulic Equipment (Power Transmission and Control)** .

700-3.4.8 DUMBWAITERS. Once each quarter, inspect dumbwaiter line (chain or wire rope), motor brake, friction clutches, overtravel limit devices, door interlock control switches, and safety devices for wear, damage or looseness. Keep chain well lubricated with the lubricant. Maintain or adjust chain tension for a chain-supported car in accordance with the specifications provided in the technical manual furnished with the equipment. Keep flame seals in operating condition at all times.

700-3.5 OPERATION AND MAINTENANCE OF SCUTTLES

700-3.5.1 Before each use, examine scuttles to detect the development of sharp edges or other projections which may damage the ammunition, and to determine that the flap-type scuttle provides an effective barrier for flames in the closed position. Scuttles shall be examined after painting to ensure that the moving parts are free. Slight casing deformation may cause a rotating scuttle to bind. The cage can usually be freed by bluing the rubbing surface and scraping until the scuttle turns freely.

700-3.5.2 Scuttle doors should be adjusted to operate freely with the door dogged tightly. The scuttle may bind with the door open if the dogs are loosened but this binding is not important. All scuttles shall be closed when not in use. Nothing shall be stowed in rotating scuttles.

700-3.6 MONORAIL AND BIRAIL TRACKS, PADEYES AND SHACKLES

700-3.6.1 Monorail and birail tracks and bridging tracks, including associated track attachments, shall be examined quarterly or before first use of the shift to ensure that they are in good operating condition. Padeyes and

shackles used for ammunition handling shall be inspected quarterly by visual inspection or before first use of the shift. The inspection should check for flange bending, cracks, defective welds and excessive wear. Portable track sections shall be stowed in their racks when not in use.

700-3.7 LIFTING EQUIPMENT RATINGS

700-3.7.1 Lifting equipment, such as slings, strongbacks, beams and shackles, is usually assembled to create a lifting assembly or rig which provides an interface between the item being lifted and the primary lifting equipment, such as cranes and hoists. Each component in the lifting rig is capable of handling a specific maximum load and is assigned a load rating. In addition, some lifting equipment may add significantly to the total weight that is being lifted.

WARNING

Always ensure that the individual rating of each component in the lifting rig is equal to or exceeds the total load which that component must lift.

For example, a shackle may carry the weight of the item being lifted plus the weight of a strongback or bridle assembly. Therefore, the shackle must be rated to handle the weight of the item lifted plus the weight of the strongback.

700-3.8 TROUBLESHOOTING (ELECTRICAL AND PNEUMATIC EQUIPMENT)

700-3.8.1 GENERAL. Repair time for pneumatic or electric hoists can be minimized by using logical troubleshooting techniques given in the following paragraphs to identify defective areas or parts prior to equipment disassembly. In addition to the following, refer to the applicable technical manuals for specific troubleshooting techniques. The same techniques apply to other equipment as well as to hoists.

700-3.8.2 PNEUMATIC HOISTS. If a pneumatic hoist loses power during operation, the air supply should be checked before the hoist is disassembled. Often the problem is traceable to the air system rather than to the hoist. Conduct this check as follows:

700-3.8.2.1 Verify that the air pressure at the hoist is correct when the hoist is not operating, and that the pressure does not drop significantly when the hoist is operated. Check the hoist technical manual for proper range. Normal pressure should be between 90 and 100 pounds per square inch (psi) in operation and 125 psi maximum when static (not operating). If pressure drop is significant, locate the problem and correct it.

700-3.8.2.2 If the pressure is correct, clean and check the air hoist filter. Clean hoist pendant control.

700-3.8.2.3 If the pressure is low, check air hose connections for leaks and air hoses for kinks or leaks. Vent air pressure line to atmosphere and check for presence of moisture, drain if necessary. Check air line lubricator for correct oil level. Adjust pressure regulator. Verify, from hoist technical manual, that air supply hose is the proper size to supply airflow when the hoist is operating with a rated load at the rated speed.

700-3.8.3 ELECTRIC HOISTS. Electric hoist malfunction is often caused by problems external to the hoist motor. The electrical power supply should be checked as described in **NSTM Chapter 300, Electric Plant-General** . In addition:

700-3.8.3.1 Inspect power cable and electrical connections for breaks, faulty insulation and power grounds.

700-3.8.3.2 Inspect control switches for dirty or faulty contacts and poor circuit continuity.

700-3.8.3.3 Inspect controller contacts for signs of welding, arcing or excessive pitting. Some discoloration is normal.

700-3.8.3.4 Check brake for proper operation and adjustment to ensure that it does not drag when power is supplied to the motor and that it is properly engaged when the power is off.

SECTION 4.

INSPECTION, TESTING AND REPAIR

700-4.1 INTRODUCTION

700-4.1.1 **GENERAL.** This section contains requirements, instructions and information needed for inspection and testing of shipboard ammunition handling equipment. Only general information considered essential to inspection and testing of equipment is included. More detailed information may be found in the appropriate technical manuals for each specific piece of equipment. The purpose of inspection and testing is to ensure that the equipment is functioning properly in all operating modes, obvious deficiencies are detected and corrected, and all adjustments critical to safety, operability and reliability are made.

700-4.1.2 **EQUIPMENT PREPARATION.** Any required equipment repairs and adjustments shall be made before inspection and testing. Repairs or adjustments found necessary during any inspection or testing phase, shall be completed and the previous inspection and testing shall be repeated before the next phase is begun. Ammunition handling equipment that has been repaired or modified shall be tested before use. Testing following repair or modification shall include load testing sufficient to demonstrate that the repair and modification work was properly completed (see [Table 700-4-1](#)). Repairs or modifications that are not covered under PMS shall be conducted using the applicable TYCOM Quality Assurance procedures.

700-4.1.3 **SAFETY PRECAUTIONS.** Safety precautions shall be observed during testing to prevent injury to personnel or damage to adjacent equipment in the event of failure. Watch personnel, safety lines, and barriers as appropriate shall be used to warn of danger during tests.

700-4.2 INSPECTION AND TEST REQUIREMENTS

700-4.2.1 **AMMUNITION HANDLING EQUIPMENT.** All shipboard equipment used to handle ammunition must be periodically inspected and tested to ensure safe and reliable operation. Shipboard ammunition handling equipment, other than ammunition lifting equipment, shall be periodically inspected and tested in accordance with Ship's Maintenance and Material Management Program (3M) and Planned Maintenance System (PMS), the Naval Aviation Maintenance Program (NAMP), and as required by applicable paragraphs in this section. Inspec-

tion and testing frequencies shall be in accordance with applicable paragraphs in this section. Personnel performing inspection and tests shall be thoroughly familiar with the equipment and their functions.

700-4.2.2 **AMMUNITION LIFTING EQUIPMENT.** Ammunition lifting equipment described in NAVSEA OP 2173 (Vol. I and Vol. II), **Approved Handling Equipment for Weapons and Explosives**, shall be inspected in accordance with NAVSEA OP 4 and periodically tested in accordance with NAVSEA SG420-AP-MMA-010, **Periodic Testing Arrangements for Ordnance Handling Equipment.** The test and inspection requirements of **NSTM Chapter 700** apply to any ammunition lifting equipment not described in these manuals.

700-4.2.3 **INSPECTION CRITERIA.** Inspection shall consist of observing the condition and functioning of all components and parts before, during and after operation. The annual detailed inspections defined here are not intended to replace daily, before use, or other routine inspections presently required, but should supplement them. In the event that annual inspections coincide with scheduled required maintenance actions or yard overhaul inspections, they both should be performed concurrently.

700-4.2.4 **INSPECTION METHODS.** Inspection shall use one or more of the following methods:

- a. Sight
- b. Sound
- c. Touch
- d. Smell
- e. Measurement
- f. Instrumentation.

Table 700-4-1. LOAD TESTING FOLLOWING MAINTENANCE

Applicable Maintenance Actions	Load Test Required (Paragraph)
1. Complete Overhaul or Major Repair (for example: replacement or repair of speed reducer motor coupling or brake).	No-load (700-4.5.1) Static (700-4.5.3) Dynamic (700-4.5.4) Rated load (700-4.5.5) These four tests are required for actions 1 through 6
2. Repair or replacement of hoisting sprockets or drums (including shafts and bearings).	
3. Replacement or repair of hoisting load or traversing brake.	
4. Replacement of load chain, wire rope or attaching hardware.	
5. Replacement of hook or block components.	
6. Replacement of trolley wheels, axles or frame.	
7. Disassembly of hook or block to inspect components. Reassembly using the same components.	No-load and Rated Load These two tests are required for actions 7 through 9.
8. Adjustment of brake or replacement of brake shoes or friction discs.	
9. Repair or replacement of components not between load brake and load (couplings, clutches, gears, shafts or motors, if not listed above)	

Table 700-4-1. LOAD TESTING FOLLOWING MAINTENANCE -

Continued

Applicable Maintenance Actions	Load Test Required (Paragraph)
10. Replacement of pneumatic, hydraulic or electrical components (other than brakes or motors)	No-load test only is required for actions 10 through 12.
11. Replacement of chain reel or basket.	
12. Replacement of load bearing fasteners such as bolts, screws, clevis pins and positive engagement pins (ball-locks) if the new fasteners are in accordance with NAVSEA drawings or directions.	
13. Replacement of padeyes, deck sockets, Baxter bolts, etc.	Static Load Test
Notes: Items 1, 2 and 6 are generally depot level maintenance actions.	

700-4.2.4.1 If cracking or deformation of load bearing and strength welds or faulty structural areas are sighted, non-destructive testing (NDT) such as magnetic particle testing should be used to augment the visual inspection.

700-4.2.4.2 When conducting inspections, disassembly of equipment should be held to a minimum to ensure that load bearing components are not disturbed. Refer to paragraph [700-4.5.2.2](#) to determine what tests are required following inspection, maintenance or repair of equipment.

700-4.2.5 PRE-INSPECTION REQUIREMENTS. Inspection and protective covers providing access to components must be removed for inspection and adjustment. The need for further disassembly for close detailed inspection beyond that specifically required, shall be determined by the head of the inspection team as needed to assist in problem diagnosis.

700-4.2.6 FIRST USE OF EACH SHIFT INSPECTION. The ammunition handling equipment operator shall perform a before-use visual inspection in accordance with the PMS for the assigned equipment before any load handling operations. A no-load operational test shall be conducted before handling ammunition (first use of each shift) in accordance with paragraph [700-4.5.1](#).

700-4.2.7 BEFORE AND AFTER INSPECTION OF SUBMARINE WEAPONS HANDLING AND STOWAGE EQUIPMENT. Before and after inspections shall be performed before and after using and before and after load testing submarine weapons handling and stowage equipment. These inspections are primarily visual, are simple to perform and shall be performed before the detailed annual procedures (see paragraph [700-4.3.2](#)). Before and after inspections shall be performed in accordance with the before and after inspection procedures found in the applicable MRC and Test Loads/Methods and Inspection Procedures document listed in [Table 700-4-2](#). When detailed procedures are not available, technical inspection guidance in this chapter shall be used.

700-4.2.8 INSPECTION OF NEW HOIST HOOKS. New hoist hooks shall meet the inspection criteria of paragraph [700-4.5.3.10](#).

Table 700-4-2. LIST OF TEST LOADS/METHODS AND INSPECTION PROCEDURES DOCUMENTS

Ship Class	NAVSEA Document Drawing No.
SSBN 640 Class	709-5032444
SSN 637/671 Class	709-5032437
SSN 688 Class	709-5549373
SSBN 726 Class	709-5549374
SSN 21 Class	752-6726350

700-4.3 ANNUAL INSPECTION OF COMPONENTS

700-4.3.1 GENERAL. The following detailed information is provided for guidance during annual inspection of ammunition handling equipment components. Component inspection shall be performed before operational testing of the equipment.

700-4.3.2 ANNUAL INSPECTION. Cranes, dumbwaiters and hoists shall be inspected annually in accordance with the PMS. PMS feedback reports (OPNAV Form 4790/7B) shall be submitted to correct deficiencies noted in annual inspection MRC's or in case annual inspection MRC's are not provided. Paragraphs 700-4.3.3 through 700-4.3.35, as applicable, are to be used until the PMS is available. The inspections in these paragraphs are minimum annual requirements.

700-4.3.2.1 Replacement Fasteners. All replacement fasteners shall be the same size, quality and grade as those specified by the equipment manufacturer, NAVSEA drawing or technical manual for the initial installation. If the fastener material is not specifically identified, replacements shall be equal in strength to the requirements of MIL-S-122 grade 8 (SAE grade 8).

700-4.3.3 ANNUAL INSPECTION OF SUBMARINE WEAPONS HANDLING AND STOWAGE EQUIPMENT. A detailed inspection shall be performed annually on submarine weapons handling and stowage equipment to determine if the equipment is in the proper condition for continued safe use. Annual inspections shall be performed in accordance with the detailed inspection procedures found in the applicable Test Loads/Methods and Inspection Procedures document listed in Table 700-4-2.

700-4.3.4 MACHINERY FOUNDATIONS. Inspect for distortion, cracked or broken welds, misalignment and corrosion. Inspect bolted connections for proper bearing of mating surfaces. Check bolted connections for missing or defective components and for compliance with design specification. Inspect each fastener for proper bearing surfaces and tightness. Replace all defective fasteners and if one fastener is found defective, inspect all remaining fasteners in the group, one at a time.

700-4.3.5 STRUCTURE, STRUCTURAL MEMBERS AND STRONGBACKS. Inspect complete component structure for broken or damaged parts and cracked, corroded or missing members. Inspect for loose fasteners, rivets, bolts, broken or cracked welds, and corrosion. Inspect support pins, bushings, retainers and mounting brackets for corrosion, damage and lubrication. Check stowage fittings for damage and misalignment.

700-4.3.6 HANDRAILS, LADDERS, WALKWAYS AND PERSONNEL SAFETY GUIDES. Inspect for excessive wear and corrosion of rungs and steps, loose connections, damaged ladder rails, loose mounting con-

nections (to structure), cracked or broken welds, loose or missing rivets, and deformed members. Inspect for proper operation of access ladder and interlock switches.

700-4.3.7 SLEWING GEARS AND BEARING ASSEMBLIES. Inspect for broken or damaged parts and cracked or missing members. Inspect gear rollers and roller paths for damage and wear, cracked or broken welds, missing anchor bolts, needed adjustments, misalignment, and lubrication.

700-4.3.8 DRIVE SHAFTS, COUPLINGS AND OPEN GEARS. Inspect shafts for wear, damage, warpage or misalignment. Inspect gears for evidence of chipping, lack of full-tooth contact, excessive tooth wear and looseness on shaft. Inspect installed couplings for looseness, binding due to misalignment, improperly installed bolts and keys, and lubrication. Inspect bearings for looseness, lubrication and discoloration caused by excessive operating temperature. Inspect support brackets for failure and cracked or broken welds.

700-4.3.9 ENCLOSED REDUCTION GEARS. Inspect gears and shafting for evidence of chipping, lack of full-tooth contact, excessive tooth wear, and looseness of keys and gears. Inspect bearing for looseness and discoloration caused by excessive operating temperature. Inspect gear case gaskets, seals and vents for evidence of leakage. Check gear case for proper lubrication level. Check for properly installed bearing caps or covers.

700-4.3.10 POSITIVE LIMIT STOPS. Inspect for broken, damaged, worn or missing parts. Where applicable, inspect hydraulic dampers for hydraulic fluid leakage at the seals.

700-4.3.11 BRAKE SYSTEMS. Inspect for binding or excessive wear in linkage, pins, cams, springs, bearings and brake linings (refer to applicable equipment manual for brake lining replacement criteria). Examine for scored brake surfaces, exposure of rivet heads (for rivet lining), lack of full-brake lining contact and unequal (tapered) brake lining wear. Check magnetic brake coils and leads for proper electrical connections, voltages and coil resistance. Check and set magnetic brake magnet air gaps and adjust operating linkages in accordance with applicable technical manual.

700-4.3.12 WIRE ROPE DRUMS. Inspect drums for distortion, cracked or broken welds, worn grooves and lubrication. Inspect drum bearings for wear, lubrication and discoloration caused by excessive operating temperature. With rope payed out to the limit of normal operation, ensure that a minimum of 2-1/2 turns remain on the drum. Inspect for proper spooling of wire rope onto the drum.

700-4.3.13 WIRE ROPE. Inspection, replacement and lubrication of wire rope shall be in accordance with **NSTM Chapter 613, Wire and Fiber Rope and Rigging**, paragraph 613-1.10, with all of the wire rope payed out.

700-4.3.14 WIRE ROPE AND FITTINGS AND EYE SPLICES. Inspect fitting sockets, fledge fittings, swaged end fittings, and Nicopress swaged collars for indications of wire rope slippage, wear, deformation and damage. Inspect eye splices for kinks, wear, broken strands and wires, flattening, and slippage.

700-4.3.15 WIRE ROPE SHEAVES. Inspect for worn or damaged sheaves, loose bearings and pins, lubrication, and damaged or missing lubrication fittings. Using radius gages, inspect sheave grooves for wear.

700-4.3.16 HOISTING LOAD BLOCKS, CLEVISES AND HOOKS. Inspect hoisting load blocks for binding sheaves, damaged or worn sheaves, worn sheave pin, broken bolts or worn cheek plates. Inspect clevis and pins (if applicable) for damage or wear. Inspect hooks in accordance with paragraph [700-4.5.3.10](#).

700-4.3.16.1 Chain Guides and Supports. Inspect chain guides for spreading or other damage which could allow a twisted link to pass. Inspect chain support and support screw (fastener) for bending, damage or looseness.

700-4.3.17 ELECTRICAL COMPONENTS. Inspect and maintain electric motors, controllers, power panels, disconnect switches, reactors, resistor assemblies, and control and limit switches in accordance with **NSTM Chapter 300, Electric Plant-General**.

700-4.3.18 EMERGENCY STOP AND INTERLOCK SWITCHES. Inspect for damaged wiring and improper electrical connections. Check switch operation.

700-4.3.19 OPERATING CUTOFF AND LIMIT SWITCHES. After completion of emergency stop switch check, set and check all operating cutoff and limit switches. Operate the equipment at slow speed and actuate all switches. Where backup switches are installed, test-operate such switches, bypassing normal limit switches if necessary.

700-4.3.20 WARNING DEVICES. Inspect for proper operation of warning lights, bells and horns. Check switch operation and inspect wiring for damage and improper electrical connections.

700-4.3.20.1 Warning and Operating Instruction Plates. Inspect and ensure that these plates are installed near operator control locations.

700-4.3.21 MONORAIL AND BIRAIL TRACKS AND PADEYES. Inspect monorail and birail tracks and bridging tracks, including associated attachments, for cracks, defective welds, excessive wear, distortion and misalignment. Inspect the padeyes used for ammunition handling for cracks, defective welds and excessive wear. Inspect stowage fittings for damage and misalignment. See [Table 700-4-3](#) for padeyes onboard submarines.

700-4.3.22 DOORS. Inspect trunk hinges, hatch hinges and dog pivots for bent or warped pins and sliding surfaces for gouges, corrosion or distortion. Inspect gasket and knife edge for damage. Conduct a chalk test IAW NAVSEA drawing 6071018 dated 6/5/86.

700-4.3.23 OVERHEAD TROLLEY HOIST AND BRIDGE CRANE SUPPORT RAILS. Check rails for alignment and birails for parallelism. Inspect for bent or damaged members and loose or missing fasteners. Inspect for excessive wear of rack and pinion gears or roller chain and sprocket(s). Inspect for misalignment of bridge crane, hoist drive, and cracked or broken welds. Verify proper condition of end stops. Check drives (chain and gear) for lubrication. Friction drive shall not be used as a replacement for sprocket and chain or rack and pinion drive.

700-4.3.24 CROSSOVER RAILS. Check crossover rail weldment and support for misalignment and loose or missing fasteners and keys. Check for binding action in track switching, damaged interlock components, actuating cylinder leakage and improper thrust cap travel. Adjust interlocks as required.

700-4.3.25 BRIDGE CRANE. Inspect for bent or damaged members, missing components, excessive deformation, cracked welds and evidence of corrosion. Inspect trolley (hoist) support rails and stops for alignment, excessive wear of roller chain, rack and pinion, sprockets, cracked or broken welds, and chain lubrication.

Table 700-4-3. LOAD TESTING EXCEPTIONS AND VARIATIONS

Equipment	Testing Required	Applicable Document
1. Cargo Nets, Tag Lines, Lashing Straps and Similar Items, Fiber Rope Block and Tackle, etc.	None	None
2. Forklift and Pallet Trucks	See Next Column	NAVSEA OP 4098
3. Handlift Trucks MK 45	None	MRC's, OP 3478
4. Ordnance Handling Equipment (OHE)	Static Load Test	NAVSEA SG420-AP-MMO-010
5. Missile and Booster Handling Bands	Static Load Test	Note 1
6. Monorails, Birails, Portable Track Sections, Padeyes and manually powered monorail torpedo dolly (DD 963, DDG 993 & CG 47 classes)	Static Load Test	Note 2
7. Slack Cable Devices and Track Clamps	Rated Load Test	Note 3
8. Submarine Padeyes	Note 4	Note 4
9. Submarine Weapons Handling Equipment	Note 5	Notes 4 and 5
10. Torpedo Retrieval Winches	Static Load Test	None
Notes to Table 700-4-3 - see paragraph 700-4.5.2.3 .		

700-4.3.26 TROLLEYS. Inspect for bent or damaged members, missing components, broken welds and loose or missing fasteners. Inspect track clamps for wear and damage; verify proper operation and engagement. Inspect wheels for wear, flat spots, chips, flange wear, cracks, loose axle pins and securing devices. Check bearings for evidence of looseness or overheating. Inspect trolley for lubrication, clearances and bearing cap (or cover) installation.

700-4.3.27 MANUAL DRIVE ASSEMBLY. Inspect for damaged components, support brackets and covers, and for loose or missing fasteners. Inspect chains, gear, handwheels and bearings for damage, wear and lubrication.

700-4.3.28 HOIST LOAD CHAIN. A hoist may be configured for link or roller chain. The full length of load chain shall be inspected; any chain that appears to be unsafe shall be removed and replaced. Inspect chain attachments and fittings for damage or looseness. Inspect chain on a link-by-link basis for the following:

700-4.3.28.1 Chain Inspection. Operate the chain in both the hoisting and lowering directions to observe chain and sprocket performance. The chain should feed smoothly into and away from the sprocket. If the chain is noisy or if it binds or jumps, inspect the full length of the chain to ensure that it is clean and within tolerances. Links should rotate and slip with respect to one another. The binding of individual links on one another will cause excessive wear at any point. It will also cause stretching of individual links or create distortion, cracks or twisted links.

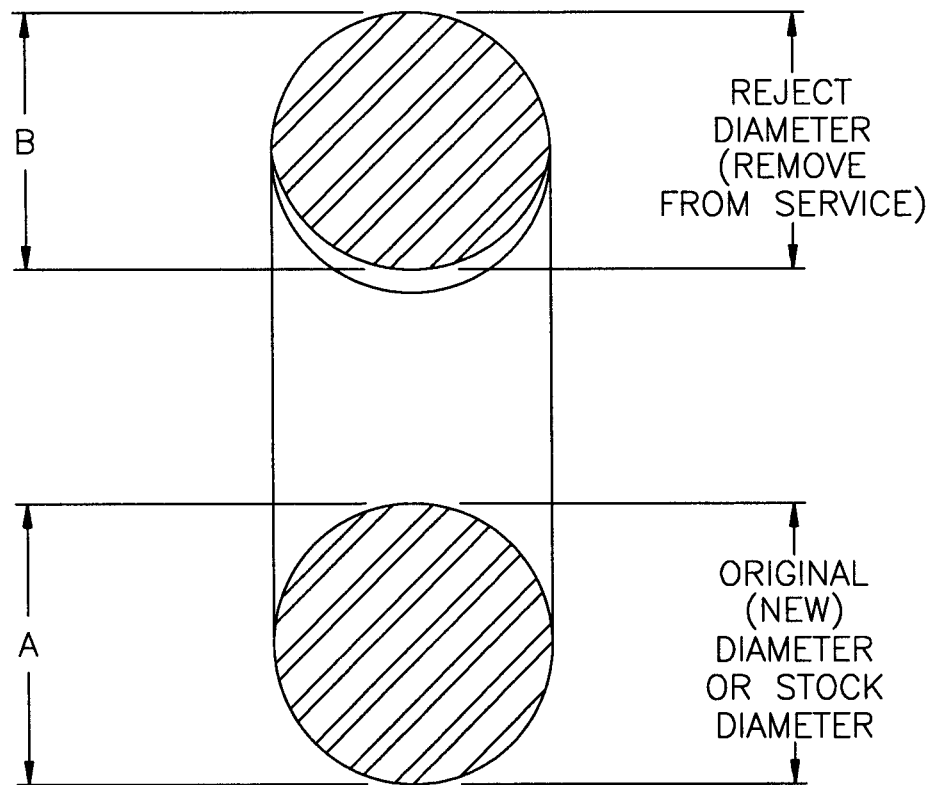
700-4.3.28.2 Chain Replacement. If inspection reveals obvious defects, or if there is a reasonable doubt as to the safe condition of the chain or any chain link or attachment, the hoist shall be tagged and removed from service until the defective chain or attachment has been replaced. The new chain is to be obtained from the same

hoist manufacturer for the same model hoist. (There is no standard link chain for a given hoist capacity.) Chain links of the same stock diameter produced by different hoist manufacturers can vary in length, width and configuration. Chain shall have manufacturer's identification markings at regular intervals.

700-4.3.29 LINK CHAIN. Link (coil) chain shall be removed from use when its nominal size stock (bar) diameter is equal to or less than the remove-from-service (reject "B" diameter, see [Figure 700-4-1](#)) diameter listed in [Table 700-4-4](#) or when the chain has elongated three percent or more. Elongation is calculated by comparing chain gauge lengths of new link chain with the inspected worn chain. The formula for determining the percent of elongation is:

$$\% \text{ of chain elongation} = [(L_{\text{worn}} - L_{\text{new}}) \times 100] / L_{\text{new}}, \text{ where } L = \text{length}$$

The inside or outside length of a given number of links may be measured as long as all chain sections are measured the same way. Measure six or more chain sections. The gauge shall be capable of measuring more than 12 inches. Gauge length is illustrated in [Figure 700-4-2](#). Replace the entire chain length if any one section does not meet the above criteria.



IF THE DIAMETER OF ANY LINK IS EQUAL TO OR LESS THAN THE (B) DIAMETER (NORMALLY DUE TO WEAR), THE CHAIN SHALL BE REMOVED AND REPLACED.

Figure 700-4-1. Chain Link Measurement

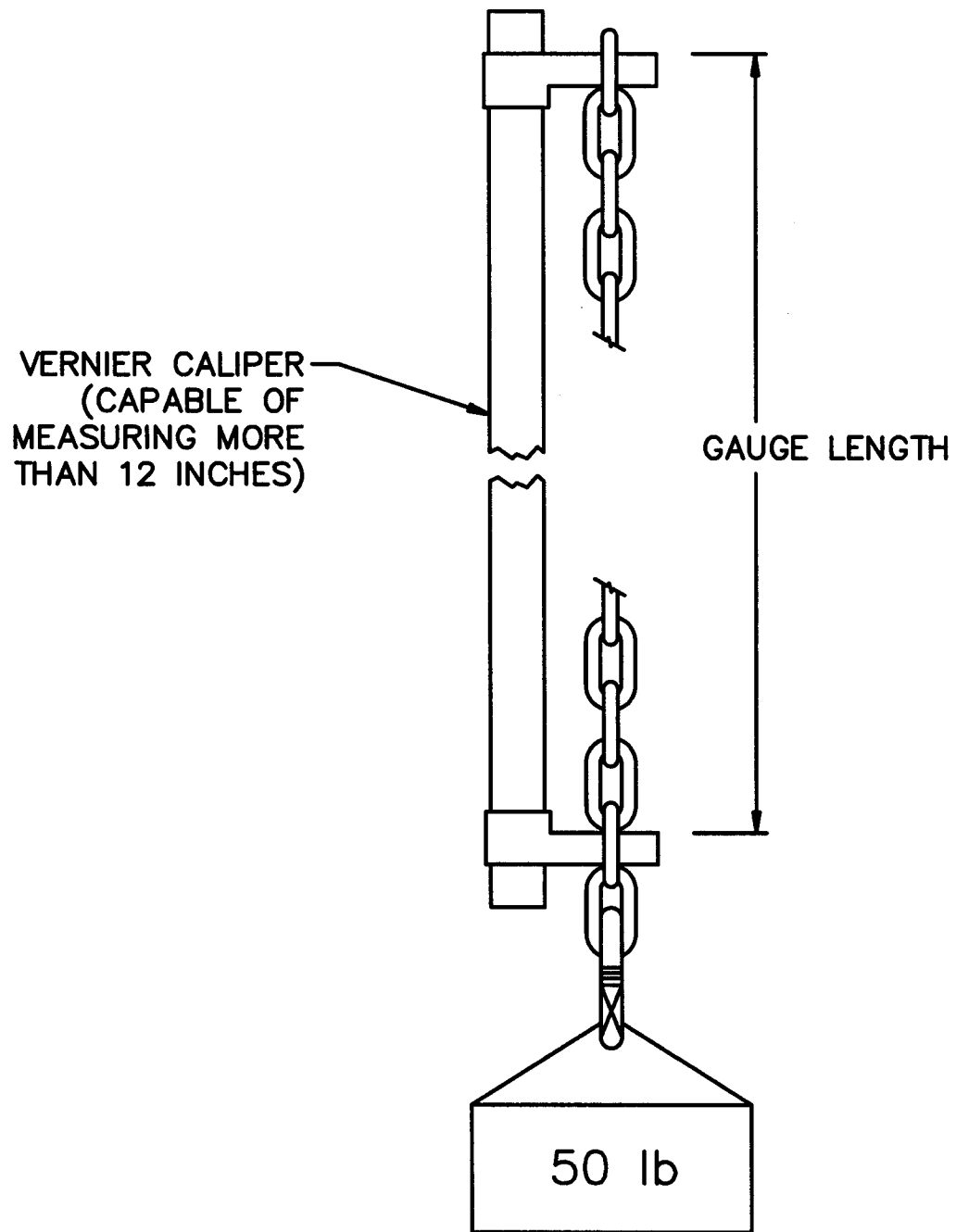


Figure 700-4-2. Chain Gauge Length

Table 700-4-4. LINK CHAIN REPLACEMENT CRITERIA

Nominal chain size (inches) Diameter "A"	Remove from service when stock (bar) diameter equals (inches) Diameter "B"
0.218 (7/32)	0.196
0.250 (1/4)	0.225
0.281 (9/32)	0.253
0.312 (5/16)	0.281
0.375 (3/8)	0.337
0.437 (7/16)	0.393
0.500 (1/2)	0.450

700-4.3.30 ROLLER CHAIN. Replace roller chain having any one of the following defects:

- Chain pitch elongation exceeds three percent as determined by measurement of gauged chain length(s) ([Figure 700-4-2](#)).
- Exceptionally loose joints.
- Pins turned from their original position.
- Joints that cannot be flexed by light hand-pressure.
- Rollers that are worn or broken or that do not turn freely with finger-pressure.
- Bent, cracked or deformed side plates, especially at the roller pin joints.
- Kinks or twists anywhere in the entire chain.
- If the roller chain appears to be twisted, remove from hoist and coil on a flat surface. Any portion which does not lie flat is considered twisted. If any portion of a load chain is twisted, replace the entire chain.

700-4.3.31 PNEUMATIC SUPPLY SYSTEM. Check air hose carrier or hose track suspension for damage, wear, pinching and improper operation. Inspect piping, hoses, fittings, valves, lubricators and pendant controls for leakage, loose connections and faulty operation. Hoses should be free from dry rot, cracks, kinking, separation from fittings or air bubbles in the lining. Check the hose date to verify it will not expire prior to the next annual inspection. Check air supply for excessive water; drain separators if necessary. Check air supply for proper pressure and reset pressure regulators in accordance with applicable technical manuals.

700-4.3.32 PNEUMATIC MOTORS AND BRAKES. Inspect for damaged, loose, or missing fasteners and support brackets. Inspect for wear in linkage, pins and cams, weakness of springs, and evidence of overheating. Inspect condition of brake drums and linings. Inspect and adjust airflow valves, if installed, as necessary. Inspect motors for corrosion, contamination and faulty operation.

700-4.3.33 HYDRAULIC AND PNEUMATIC ACTUATING CYLINDERS. Inspect cylinders for leakage, loose fittings and loose mountings. Check operating rods and linkages for deformation, corrosion and excessive wear. Check valves, switches or indicators for proper adjustment and operation.

700-4.3.34 HYDRAULIC PUMPS AND MOTORS. Inspect for leaks, loose fittings and loose mountings. With pumps and motors running, listen for unusual noise and vibration. If installed, check hand pump operation for emergency use.

700-4.3.35 NATURAL AND SYNTHETIC FIBER ROPES. Natural and synthetic fiber ropes shall be inspected in accordance with the requirements in **NSTM Chapter 613, Wire and Fiber Rope and Rigging** .

700-4.3.36 J-DAVITS AND KINGPOSTS AND BOOMS. Ensure J-davits and kingpost and booms are installed in accordance with ships installation drawings. Check for damaged or missing components.

700-4.4 SAFETY GUIDELINES FOR TESTING

700-4.4.1 Safety guidelines for load testing facilities are contained in NAVSEA SG420-AP-MMA-010, **Periodic Testing Arrangements for Ordnance Handling Equipment** .

700-4.5 TESTING

700-4.5.1 NO-LOAD TEST. No-load tests shall be conducted annually after the satisfactory completion of the annual inspections defined in applicable paragraphs in paragraph 700-4.3 on all powered (includes hand-operated) shipboard ammunition handling equipment, except forklifts and pallet trucks. No-load tests are conducted to determine if the equipment is capable of safe operation for all functional modes of the design. Reference to the equipment specification, technical manual or MRC's, will aid in defining the scope and procedures for specific no-load testing. The equipment shall be required to function through the full specified operating ranges and directions. Specifically, the equipment shall operate as described in the following paragraphs:

700-4.5.1.1 Crane and Hoist Load Hooks and Dumbwaiters. Crane and hoist load hook(s) and dumbwaiters shall raise and lower through the full range of travel at rated speed for three complete cycles.

700-4.5.1.2 Hoist Trolleys. Hoist trolleys shall operate through the full limits of travel at rated speed, for three complete cycles (one cycle only for manual drive trolleys).

700-4.5.1.3 Bridge Cranes. Bridge cranes shall operate through the full limits of travel at rated speed, for three complete cycles (one cycle in case of manual bridge drive).

NOTE

Do not permit a crane to hit bumper stops at full speed.

700-4.5.1.4 Traveling Cranes. Traveling cranes shall operate through the full limits of travel at rated speed, for three complete cycles.

700-4.5.1.5 Rotating King Posts, Pedestal and Traveling Mounted Cranes. Rotating kingpost, pedestal and traveling mounted cranes shall operate through the full rotational range at rated speed, for three complete cycles. Cranes shall be topped through the full range of travel for three complete cycles. Cranes with telescoping booms shall be operated through minimum to maximum lengths for three complete cycles.

700-4.5.1.6 Equipment with Unusual Operating Features. Equipment with unusual operating features shall be operated sufficiently to demonstrate proper operation of such features. During the test, all travel-limiting devices, such as switches, valves or mechanical stops, shall be operated a sufficient number of times to demonstrate proper

operation. All safety devices shall be tested and inspected separately for proper operation. Equipment shall be operated using normal operating and control procedures.

700-4.5.1.7 Component Inspection. Guidance for component inspection during operating tests follows:

700-4.5.1.7.1 Check operation of limit switches during the last portion of the operating cycle. Operate each motion at slow speed to actuate the limit switches to stop overtravel. Actuate all emergency switches.

700-4.5.1.7.2 Check for delay, overheating or restriction in brake operation. Check for smooth application and proper stopping.

700-4.5.1.7.3 Observe for evidence of binding, warping, permanent deformation, and cracking or malfunction of structural and operating components.

700-4.5.1.7.4 Check for abnormal noise or vibration and overheating in machinery drive components.

700-4.5.1.7.5 Check wire rope sheaves, drum spooling, wire rope fastenings and terminal hardware for proper operation, freedom of movement, lack of unusual noise or vibration, and satisfactory operation of sheave guards and wire rope spooling. Check for a minimum of 2-1/2 turns of wire rope left on the drum for the extreme position of lowered or extended hoist rope.

700-4.5.1.7.6 Check electrical drive components for proper operation and freedom from chatter, noise, vibration, or overheating.

700-4.5.1.7.7 Check electrical interlocks for proper operation.

700-4.5.1.7.8 Check the pneumatic drive system for evidence of air leakage, loose connections, vibration, and improper lubrication; verify system response. Check air pressure gauge for proper operating pressure.

700-4.5.1.7.9 Check hydraulic components for smooth operation and proper stroke of operating cylinders. Check for slamming within system as valves open and close, leaks, evidence of entrapped air in the system, abnormal vibration or noise, and hydraulic fluid temperature limits.

700-4.5.2 LOAD TESTING. All shipboard ammunition handling equipment shall be load tested, at a minimum, every 48 months, after repair or replacement of load bearing components, or after equipment overhaul. Load testing exceptions and variations are listed in [Table 700-4-3](#). It is preferable that load testing be accomplished during ship overhaul.

700-4.5.2.1 Load Testing Requirements. Load testing is required before resumption of load handling operations following corrective maintenance on load bearing components as listed in [Table 700-4-5](#). Corrective maintenance or adjustment of safety features can normally be tested without weight handling (for example, non-load testing). Load testing is always required where the repaired or adjusted component is the last-line-of-defense against uncontrolled movement of the load (for example, brakes). To determine what load testing is required after a particular maintenance action, see [Table 700-4-1](#) for general guidance. Limited testing (requires NAVSEA approval)

may be accomplished in a loaded magazine by limiting the test to an area that will prevent the test load from moving over or being suspended over stowed ammunition. The full test shall be accomplished at the first available offload.

700-4.5.2.2 Sequence of Testing. Load testing shall be preceded by the applicable portions of the annual inspection of components and the no-load test. Load testing of non-powered handling equipment shall consist only of a static test. The test weights shall be within a plus tolerance of five percent or 200 pounds, whichever is smaller. The following notes refer to [Table 700-4-3](#):

Note 1: Missile and booster handling bands shall be load tested every four years, preferably to coincide with missile overhaul, except that bands required for stowing missiles and boosters on board ship shall have been tested within 12 months before installation on the weapons.

Note 2:

- a. Monorail and birail hoist track sections, whether portable (such as those used in modular ammunition stowage) or permanently attached to the ship structure, shall only be load tested following initial installation, modification or major repair. Static load testing of bridge tracks and trolley hoist tracks shall be conducted with the test load, or loads, positioned to impose maximum loading on each end support of each track section, every fourth similar consecutive support, each unique support, each switch and turntable support, and also at the center of the longest track span. Failure of any support shall require testing of all supports.
- b. Padeyes and deck sockets permanently attached to the ship structure and used for ammunition handling shall only be load tested following initial installation, modification or major repair. Only 10 percent of the padeyes and deck sockets need be tested. If one fails, test all of the padeyes and deck sockets.
- c. Portable track sections that are relocated to accommodate different weapon loads do not require retesting after reconfiguration; however, system components shall be inspected in detail.

Note 3: Test as specified in paragraph [700-4.5.6](#).

Note 4: Padeyes used for ammunition handling on board submarines shall be inspected and tested in accordance with section 9120-5 of the **General Overhaul Specifications for Deep Diving SSBN/SSN Submarines (DDGOS)**.

Note 5: Submarine weapons handling equipment shall be tested in accordance with the latest revision of the applicable Test Loads/Methods and Inspection Procedures documents listed in [Table 700-4-2](#). Submarine weapons loading and handling equipment shall undergo a 200 percent static load test. Powered equipment shall undergo a 150 percent dynamic load test after successfully completing the static load test. Exceeding the rated load of the equipment is permitted under test conditions.

Table 700-4-5. LOAD BEARING COMPONENTS

Load Bearing Components	Applicable Maintenance Actions (Table 700-4-1)
1. Hoisting Motor	1
2. Hoisting Gearbox (Gears, Shafts)	1
3. Hoisting Drive Sprocket	2
4. Wire Rope Drum, Axles, Shafts Bearings, etc.	2
5. Hoisting Load Brake	3
6. Traversing Brake	3
7. Load Chain and Wire Rope	4
8. Load Hook, Block or Clevis (includes attaching hardware)	5

Table 700-4-5. LOAD BEARING COMPONENTS - Continued

Load Bearing Components	Applicable Maintenance Actions (Table 700-4-1)
9. Suspension Hook (and hardware)	5
10. Trolley Wheels and Axles	6
11. Trolley Frame	6
12. Load Bearing Fasteners (bolts, nuts, etc.)	12
13. Shackles	None
14. Traversing Motor	9
15. Traversing Drive Gears or Drive Sprockets	9
16. Traversing Gearbox (Bearings, Gears, Shafts, Couplings, etc.)	9

700-4.5.2.3 Sequence of Load Testing and Inspections. Load testing of powered and manually-operated handling equipment shall consist of the tests in the sequence listed in [Table 700-4-6](#).

700-4.5.2.4 Complex Handling Equipment. Complex handling equipment that operates in several dimensions, such as overhead bridge cranes and monorail or birail trolley systems, shall be operated in all possible dimensions of powered motion during dynamic and rated load testing.

700-4.5.2.5 Test Equipment. Test equipment shall be designed to simulate the load conditions that items to be tested actually experience during service use. Equipment guidelines for test setups for specific ammunition lifting equipment are contained in NAVSEA SG420-AP-MMA-010, **Periodic Testing Arrangements for Ordnance Handling Equipment**.

Table 700-4-6. SEQUENCE OF LOAD TESTING AND INSPECTIONS

Sequence	Major Inspection or Test (Paragraph)	Periodicity
1	Component Inspection (700-4.5.1.7)	Annually (and before load testing) for sequences 1 and 2.
2	No-load Test (700-4.5.1)	
3	Static Load Test (700-4.5.3)	See 700-4.5.2.1 for sequences 3, 4 and 5.
4	Dynamic Load Test (700-4.5.4)	
5	Rated Load Test (700-4.5.5)	

700-4.5.2.6 Authorized Testing Activities. Load testing of ammunition handling equipment may be conducted by any activity as long as the testing is in accordance with applicable paragraphs in [Section 4](#). Load testing of ammunition lifting equipment, described in NAVSEA SG420-AP-MMA-010, may be conducted at Naval Weapons Station Earle, Colts Neck, NJ or Concord, CA; or other activities as long as the testing is in accordance with that manual. Load testing of submarine weapon handling equipment may be conducted by an Intermediate Maintenance Activity (IMA) or by any qualified shipyard or industrial activity.

700-4.5.3 STATIC LOAD TEST. A static load test physically tests the structural and mechanical integrity of ammunition handling equipment. Loads may be applied by test weights or by mechanical devices with load measuring gauges, depending on the test requirements and facility availability. The following discussion outlines the general static load test procedures for use on this equipment. These procedures were developed to cover broad

applications and may be used for guidance in applying those sections and items most appropriate to the equipment undergoing testing. These procedures are not intended to supersede any of the specified load-testing requirements.

700-4.5.3.1 Equipment Positioning. The equipment to be tested shall be positioned to provide the most critical stresses to equipment and the support structure. For example, cranes shall be topped to the lowest boom angle capable of handling the highest rated loads. This lowest boom angle is to be determined prior to the load test. Consult appropriate technical manual. Bridge cranes and trolley hoists shall be positioned to impose maximum stress on the bridge or support rail and shall include extreme and midspan positions. See [Table 700-4-3](#) for testing of rails or tracks.

700-4.5.3.2 Safety Precautions. Equipment shall be positioned to provide maximum protection in case of failure. Topside cranes shall be positioned with the test load outboard and suspended just clear of the cribbing on the pier or barge. Elevator platforms shall be lowered to a point approximately six inches clear of the bumpers. Hoist test loads shall be suspended over cribbing to distribute the load on deck in case of failure. Where practical, loads shall be applied by an auxiliary hoist, or by using dynamometers or other load-measuring devices in place of test weights.

700-4.5.3.3 Application. The static test load shall be equal to 200 percent of the rated load and shall be applied while the ship is at pier side or moored in calm seas unless otherwise specified. In the event the static test must be conducted while the ship is at sea, the static test load shall be 150 percent of rated load while the ship is underway in moderate seas (Beaufort Sea State 3 or less). Equipment being tested shall hold the static test load for a minimum of 10 minutes. Equipment shall be visually examined and inspected for evidence of permanent deformation, brake slippage or other damage.

CAUTION

Equipment shall not be operated with static test loads as damage to equipment may result.

700-4.5.3.4 Equipment. Some ammunition handling systems or equipment may have lifting components with manufacturer's cited capacity greater than rated load. However, load testing shall be based upon rated load.

700-4.5.3.5 Test Load Methods. Test loads on hoists, cranes and booms may be applied by one of the methods described in the paragraphs below:

700-4.5.3.6 Method 1 for Static Loading. The steps of method 1 are as follows:

1. Put two sets of slings on test load.
2. Using an auxiliary hoist with rated capacity equal to the test load, lift test load six inches clear of cribbing.
3. Slip hook or load fitting of equipment being tested through second sling and take up slack.
4. Slowly lower test load with auxiliary hoist, stopping the lowering at least twice.
5. Lower load until slack develops in auxiliary hoist line. Leave test load suspended from hoist or equipment for 10 minutes.

6. Raise test load with auxiliary hoist until it is removed from tested equipment.

700-4.5.3.7 Method 2 for Static Loading. The steps of method 2 are as follows:

1. Attach partial test load, equal to 150 percent of rated load, to equipment being tested and lift clear of support. For equipment with overload limit device, partial test load should not exceed overload limit.
2. Add remainder of static test load by auxiliary means.
3. Additional loads must be added and removed slowly.
4. Lower partial test load back to support.

700-4.5.3.8 Method 3 for Static Loading. The steps of method 3 are as follows:

1. Apply the additional or entire test load by an auxiliary hoist with capacity equal to load applied. Use a load-measuring device or dynamometer to monitor the test.
2. Rig auxiliary hoist between padeye (or other attachment point) and the load-measuring device attached to the load fitting of the equipment being tested. Apply the test load for 10 minutes.
3. Apply and remove test loads gradually, keeping clear of the load.

700-4.5.3.9 Observations and Inspections. Observations shall be made during performance of load tests by test personnel to detect defects, such as brake slippage or component malfunction, that are not necessarily apparent during inspections after load testing.

NOTE

Brakes on pneumatic hoists may require adjustments to prevent slippage during static load test. After static test, readjust brakes in accordance with applicable technical manual.

700-4.5.3.9.1 Inspections as described in paragraphs 700-4.5.3.11 and 700-4.5.3.12 shall be made immediately following static load test.

700-4.5.3.9.2 All load bearing parts, strength welds, and repaired areas shall be visually inspected for evidence of permanent deformation, cracking, binding, warping, or wire rope slippage in sockets and fittings. If any cracking or deformation is sighted, or suspect, paint shall be removed from the suspect area, and a qualified non-destructive test (NDT) inspector shall perform magnetic particle or liquid penetrant tests in accordance with MIL-STD-271, **Non-Destructive Testing Requirements for Metals**, and shall meet the acceptance criteria for MIL-STD-278, **Fabrication, Welding and Inspection; and Casting Inspection and Repair, for Machinery, Piping, and Pressure Vessels for Ships of the U.S. Navy**, and NAVSEA 0900-LP-003-8000, **Metals, Surface Inspection Acceptance Standards**. The specific load bearing parts and strength welds to be inspected shall be determined by the test activity.

700-4.5.3.10 Inspection of Hooks. Inspection reports for the hoist and hook shall be maintained. Hooks must be marked with a manufacturer's identification and the manufacturer's rated capacity or identification code. Replace hooks that do not have these markings. Inspect hook or clevis swivels and pins for wear. Inspect hook

throat for wear, cracks or gouges, and clevis pin for ease of removal or deformation. Replace hooks when the material or cross section loss exceeds ten percent or when there is more than a 10-degree twist from the plane of the unbent hook.

700-4.5.3.10.1 Measure the hook throat opening as indicated in [Figure 700-4-3](#). This opening should not be less than the values given in [Table 700-4-7](#) for any particular hoist capacity. The values given in [Table 700-4-7](#) determine whether the hook will fit a shackle of the same rated load.

700-4.5.3.10.2 A hook must be replaced when its deformation exceeds fifteen percent of its original pre-use dimension. To assist in calculating this value, some hook manufacturers are now providing deformation indicators on their hooks. For hooks with manufacturer's deformation indicators, refer to [Table 700-4-8](#) for calculation of maximum deformation of typical hooks. For hooks with tram points (typically 2 punch marks on opposite sides of the hook throat opening) having historical inspection data for the particular hoist and hook available, the tram points may be used to calculate the deformation of the hook. Measure and record the current tram point dimension. If the hook has no historical data for tram point markings, or the hook does not have tram points, deformation of the hook is to be determined based on original hook throat opening measurements given in hoist and hook vendor catalogues. For these hooks, record the current and original throat opening dimensions.

700-4.5.3.10.3 For hooks being load tested, replace hook if hook throat opening increases more than five percent from pretest dimension.

700-4.5.4 DYNAMIC LOAD TEST. Following completion of the static load test, powered (includes manually-operated) handling equipment (with the exceptions listed in [Table 700-4-3](#)) shall be subjected to dynamic load testing. A dynamic load test is used to test and demonstrate the capability of powered handling equipment to operate with a rated load under the dynamic conditions of ship motion and equipment operation. As in the case of the static load test, these general procedures were developed to cover broad applications and may be used as guidance as appropriate to the equipment undergoing testing.

700-4.5.4.1 Pre-test Requirements and Precautions. The dynamic load test shall be conducted to demonstrate handling equipment load capabilities through the complete operating range. Suspended loads shall be kept clear of facilities and equipment located within the operating limits if the equipment or facility might sustain damage in the event of equipment failure. If practical, facilities and equipment not involved in test work shall be moved clear of the testing operations to avoid damage in the event of equipment failure. If the test load weight could cause the ship to list, lines and shore hotel services shall be checked for adequate length to accommodate the lists. Do not exceed specified operating limits of the equipment being tested.

CAUTION

Main and auxiliary hook test loads shall not be lifted simultaneously.

Table 700-4-7. HOOK THROAT OPENINGS*

Hoist Rated Load (tons)	Minimum Hook Throat Opening for New Hooks (inches)
0.5	3/4
1	29/32
1.5	1
2	1-1/8
4	1-3/8
5	1-5/8
7	2-1/16
12.5	2-1/4
15	2-3/4
20	3

*Table 700-4-7 shows minimum throat openings for new hooks. Actual manufacturer's values generally exceed the indicated minimum opening. Consult manufacturer's catalogs for original dimensions.

700-4.5.4.2 Method of Testing. Dynamic test loads shall be equal to 150 percent of the rated load while the ship is at pierside or moored in calm seas. If the dynamic load test must be conducted while the ship is at sea (Beaufort Sea State 3 or less), use test loads equal to 125 percent of the rated load. As far as practical, test loads shall be moved completely through the equipment operating range, within the limits of all operating modes (hoisting, rotating, traversing, raising, lowering and traveling). The equipment with the test load shall be stopped at least three times in each direction to ensure proper brake operation. No speed is specified; however, the maximum speed attainable with the required test load is to be used, such that damage to the equipment is avoided.

700-4.5.4.3 Observation and Inspection. During performance of the dynamic load test, components shall be observed and inspected as instructed in paragraph [700-4.5.3.10](#).

700-4.5.5 RATED LOAD TEST. Following satisfactory completion of static and dynamic load tests, powered (includes manually-operated) weight handling equipment shall be subjected to a rated load test. The rated load is a nonvariable weight (in pounds) identified on the label plate or tag, and is specifically designated for each type of equipment. Ammunition handling equipment may handle lighter than rated loads. A change of rated load requires NAVSEA approval.

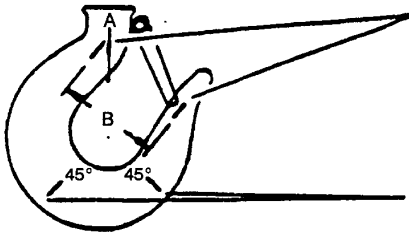
700-4.5.5.1 Method of Testing. While the ship is pierside or moored in calm seas, the rated load test shall be conducted using test loads equal to 100 percent of the rated load of the equipment. If the load test is conducted while the ship is underway in moderate seas (Beaufort Sea State 3 or less), the rated test load shall be equal to 80 percent of the rated load. Once the ship returns to port, the equipment shall be retested to 100 percent. Rated load tests are used to demonstrate equipment capability to operate with a full load at the rated speed through the complete range of operating limits. To meet the requirements, test loads shall be moved at the rated speed through the complete operating range of the equipment, using limits of all operating modes (hoisting, rotating, traversing, raising, lowering and traveling). The rated load test shall be repeated a minimum of 10 continuous cycles or one-half hour whichever is greater to demonstrate proper operation and repeatability of all functions without overheating drive motors, gear boxes or brakes; or without giving other evidence of malfunction. If an automatic operating mode exists, the equipment shall be operated in the automatic mode to demonstrate proper functioning at each position, stop or level.

Table 700-4-8. HOOK DEFORMATION VALUES

Hoist Series Cooper Power	Rated Capacity (lbs)	Crosby's Hook Identi- fication Code From Loca- tion A	Normal Deformation Indicator Dimension B	Maximum Deformation Indicator Dimension B	Hook Replacement Latch Part Number	Bullard Replacement Latch Kit Part Num- ber	Original Hook Throat Opening
KG1	275	DC	1.50"	1.725"	507523	---	0.875"
P1	1000	DA	1.50"	1.725"	507523	---	0.875"
KG1, KG5, P1	1000	FC/FA/FB	1.50"	1.725"	A27305	526566	0.938"
KG5, P2	2200	HC	2.00"	2.300"	A27352	528567	1.125"
P3	4300	HA	2.00"	2.300"	A27352	528567	1.125"
P2	1500	HB	2.00"	2.300"	A27352	528567	1.125"
KG10, P2, P3	4400	IC/IA	2.50"	2.875"	507938	528618	1.344"
P2	3000	IB	2.50"	2.875"	507938	528618	1.394"
KG10, P3	8800	JC	3.00"	3.450"	516719	528618	1.688"
KG10 Low Head- room	6000	Columbus McKinnon #7 or D	2.50"	2.875"	539808	---	1.655"
P2, 2V	4400	Valcan #7	---	---	539808	---	1.685"

DEFORMATION INDICATORS:

Two strategically placed marks, one just below the shank or eye and the other on the hook tip, which allows for a QUIC-CHECK measurement to determine if the throat opening has changed, thus indicating abuse or overload.



To check, use a measuring device (i.e., tape measure) to measure the distance between the marks. The marks should align to either an inch or half-inch increments on the measuring device. If the measurement does not meet this criteria, the hook should be inspected further for possible damage.

ANGLE INDICATORS:

Indicates the maximum included angle which is allowed between two (2) sling legs in the hook. These indicators also provide the opportunity to approximate other included angles between two sling legs.

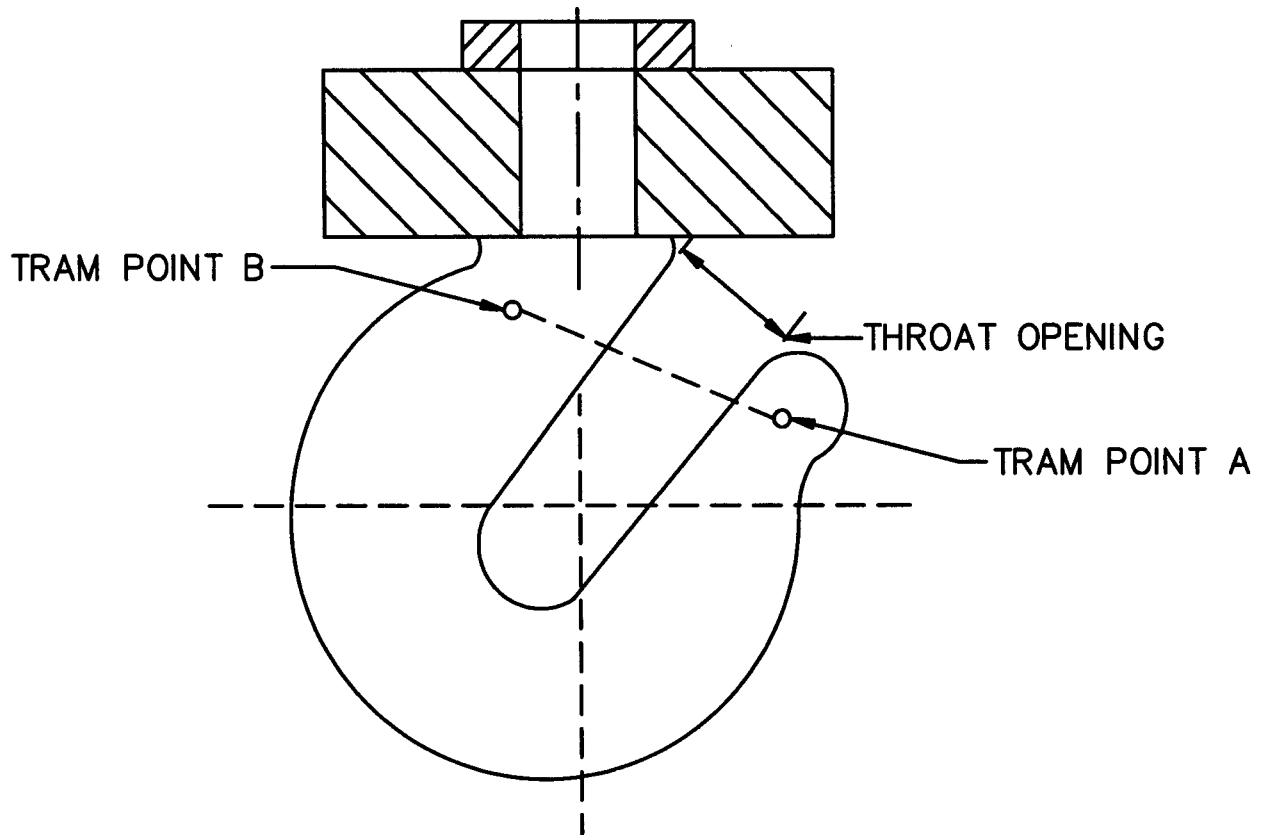


Figure 700-4-3. Load Hook

700-4.5.5.2 Interlock Testing. The performance of all interlock and limit switches shall be tested. To demonstrate adequacy of control and braking, emergency stop controls (if any) shall be actuated with equipment operating with rated load at highest rated speed in lowering direction, once for each mode of operation. Slack cable devices and track clamps shall be tested to demonstrate proper operation (for whip hoists) in accordance with paragraph 700-4.5.6.

700-4.5.5.3 Observations and Inspections. During the rated load tests, equipment and components shall be observed and inspected using the no-load test guidance provided in the appropriate paragraphs in paragraph 700-4.5.

700-4.5.6 WHIP HOIST SLACK CABLE (RAIL CLAMP) SAFETY DEVICE OPERATIONAL TEST (TYPICAL TEST). Preparations and procedures for testing the whip hoist slack cable (rail clamp) safety device, hereafter referred to as the slack cable device (SCD), are given below. This test is for a davit, whip hoist, and rail-guided skipbox (Figure 700-2-2 and Figure 700-4-4). Variations exist for winch operated systems.

700-4.5.6.1 Preparations.

a. Tools Required:

1. Quick-release hook, or equivalent ([Figure 700-4-4](#))
2. Test weights equivalent to the rated capacity of system (50 lb increments recommended)
3. Wooden pallets (2) to protect deck under skip box.
4. Rope, 1/4-inch, 20 to 30 feet long for actuating quick release hook.
5. Ladder

b. Minimum Manning:

One on upper level at hoist controls, one at intermediate levels where applicable and three on lower level, two for handling test weights and one test director.

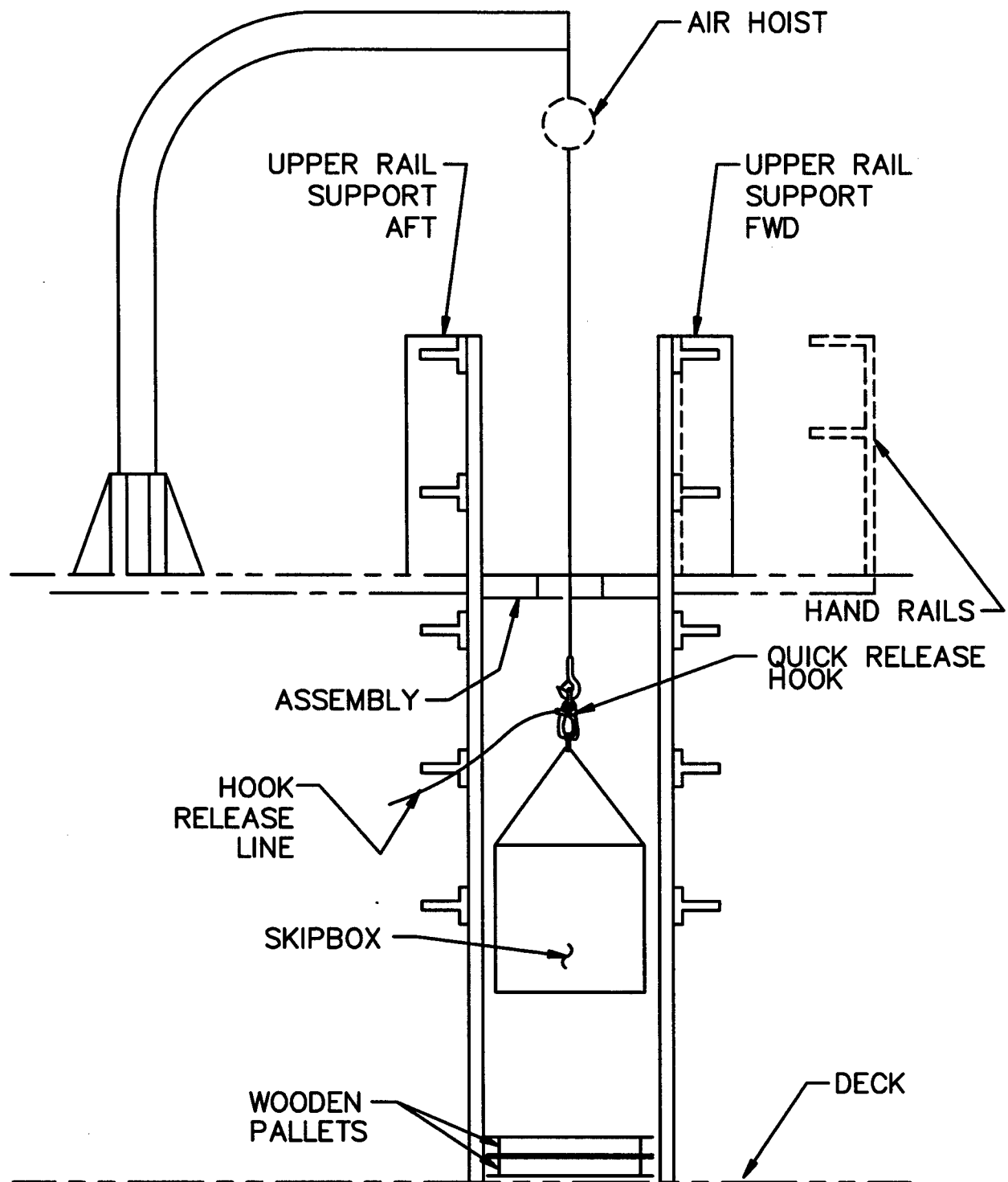


Figure 700-4-4. Slack Cable Device Test

700-4.5.6.2 Procedures.

1. Assemble the system [davit, hoist (pneumatic or electric), controls, skipbox (or basket)].

NOTE

If the hook does not stop in its normal position, do not operate the hoist until the cause of the problem is located and corrected.

2. Slowly run the unloaded hook of the hoist to both extremes of travel and observe the operations of the UP and DOWN stops.

NOTE

Do not operate the hoist unless the chain feeds through the hoist smoothly, without clicking or other evidence of binding.

3. Observe the action of the chain feeding through the hoist.
4. Place two wooden pallets or other suitable shock-absorbing equipment on the level directly below the skipbox.
5. Place a full-capacity dummy load in the skipbox and raise it a few inches above the pallets. Check the ability of the hoist brake system to stop and hold the load without slippage.
6. Lower the skipbox to the lower level and onto the pallets. Continue lowering the skipbox until the hoisting line (cable or chain) is slack. Inspect the engagement of the SCD with the guide rails. Unload the dummy load.
7. Disconnect the hoist hook from the skipbox.
8. Assemble the quick-release hook onto the hoist hook and connect it to the rigging of the skipbox (Figure 700-4-4). To avoid inadvertent release, ensure that the quick-release hook snaps shut.
9. Tie one end of the rope to the eye of the quick-release hook. Check twice to ensure that the hook releases properly when the rope is pulled.
10. Load a 50 lb test weight into the skipbox.
11. Raise the skipbox, stopping it approximately four feet above the pallets.

WARNING

Ensure that all personnel are clear of the hoist area.

WARNING

Release-rig operator shall wear eye protection and a hard hat.

12. Pull the rope to release the hook. The skipbox should not drop more than 6 inches.

NOTE

If the skipbox drops more than 6 inches repeat the test without increasing the load. If the skipbox does not drop more than a few inches, continue testing.

13. Reattach the quick-release hook to the rigging on the skipbox.
14. Lower the skipbox until it rests on the pallets.
15. Install additional weight in no greater than 250 lb increments.
16. Raise the skipbox, stopping it four feet above the pallets.
17. Pull the rope to release the hook. The skipbox should not drop more than 12 inches.

NOTE

If the skipbox drops more than 12 inches repeat the test without increasing the load. If the skipbox does not drop more than a few inches, continue testing.

18. Repeat steps 13 through 17 until the full rated load is reached.
19. Reattach the quick-release hook to the rigging on the skipbox.
20. Lower the skipbox until it rests on the pallets.
21. Raise the skipbox with the full load. When the skipbox (traveling upward) is five feet above the pallets, pull the rope to release the quick-release hook.

NOTE

The skipbox should not drop more than one foot. Repeat the test twice. If the skipbox drops more than one foot before stopping, stop the test. If the skipbox does not drop more than one foot before stopping, continue testing.

22. Reattach the quick-release hook to the rigging on the skipbox.
23. Lower the skipbox until it rests on the pallets.
24. Raise the skipbox, stopping it about 8 feet above the pallets.
25. Start lowering the skipbox. When the skipbox (traveling downward) is approximately five feet above the pallets, pull the rope to release the quick-release hook.

NOTE

The skipbox should not drop more than one foot. Repeat the test twice. If the skipbox drops more than one foot before stopping, stop the test. If the skipbox does not drop more than one foot before stopping, the test is complete.

700-4.6 INSPECTION AND TEST RECORDS

700-4.6.1 MARKING SAFE HANDLING EQUIPMENT. Handling equipment that has satisfactorily passed the required inspections and load testing shall be so marked by the activity conducting the tests. A record of each test shall be maintained by the testing activity. As a minimum, marking shall include the name of the testing activity, the date (yr, mo) tested and the rated load or Safe Working Load (SWL). For submarine weapons handling equipment, see paragraph [700-4.6.5](#). New handling equipment shall be load tested and marked by the

manufacturer as specified in the applicable procurement documents. Since padeyes and rails are only load tested at installation, modification or major repair, they shall be marked with load, design working load and date of test. For padeyes, the direction in which the test load is applied shall also be included.

700-4.6.2 MARKING DEFECTIVE HANDLING EQUIPMENT. Handling equipment found to be defective shall be affixed with a material condition tag in accordance with MIL-STD-129 containing a description of the defect(s) and shall be set aside in a designated area for further disposition. It shall not be placed in service under any circumstances unless repaired and retested to prove that its safe working load is as specified.

700-4.6.3 MARKING METHOD. The marking method shall be appropriate to the particular item subject to the following provisions:

- a. Legible marking may be stenciled in a contrasting color of paint on a conspicuous surface, provided that such surface is not subject to rubbing or dragging which might remove or deface the marking.
- b. Equipment with recessed or nonvulnerable, but easily seen areas, such as certain handling bands, may be marked with a pressure sensitive tape, providing the tape and lettering are durable and will not deteriorate while the equipment is in use or during conditions of stowage.
- c. Where there is little available space for surface marking, such as on wire rope slings, the item may be marked with a Periodic Load Test Record Strap. Stamped, etched or engraved metal tags, which are attached to the tested item with mechanical fasteners or adhesives, may also be used. Wired-on metal tags shall not be used. The nomenclature of the Periodic Load Test Record Strap ([Figure 700-4-5](#)) is Strap, Tiedown, Electrical Components, Adjustable, Self-clinching, Plastic, Type I, Class I, in accordance with MS3367-3-9. The information recorded on the strap, if used, shall be steel stamped, etched or engraved in depressed, legible letters and numbers filled in with black engraving filler, TT-F-325.

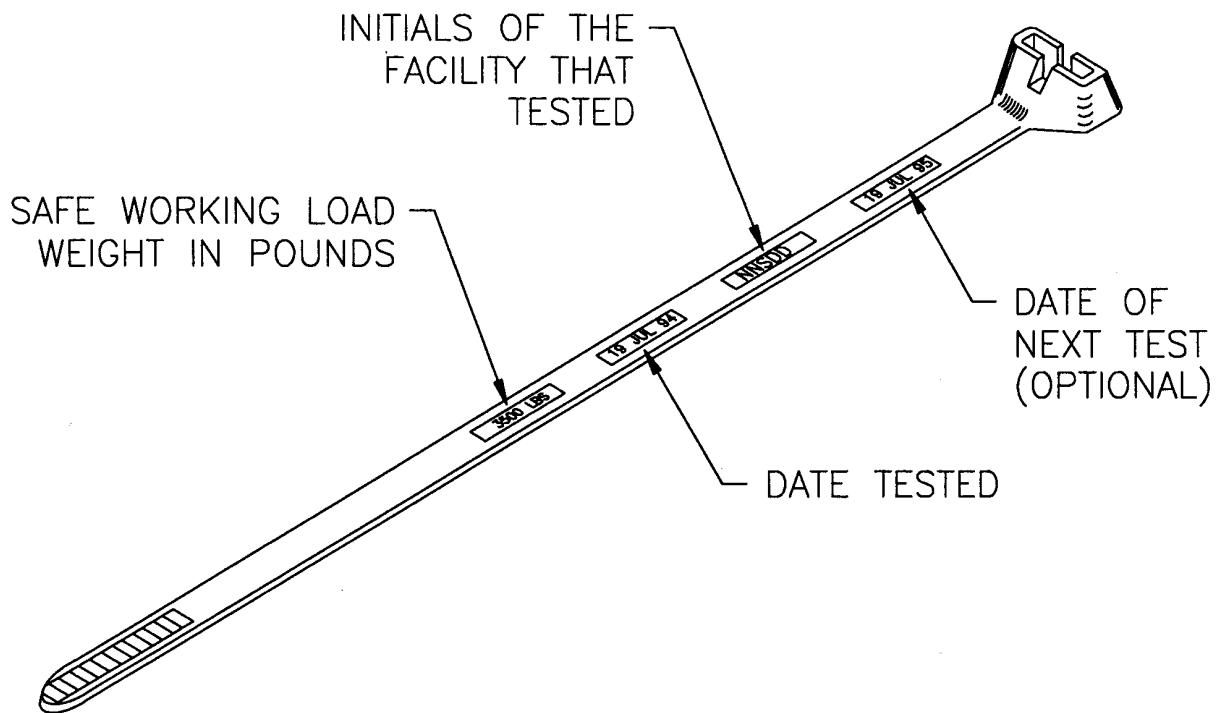


Figure 700-4-5. Periodic Load Test Record Strap

700-4.6.4 COLOR CODING. Color coding, for local control only, may be used in addition to, but not as an alternate to, one of the authorized marking methods.

700-4.6.5 PERMANENT LOG. Subsequent to marking, the following information shall be recorded in a permanent log:

NOTE

The serial number (if known) of the equipment shall be recorded on the weight test memorandum.

- a. Equipment identification
- b. Date of test or inspection
- c. Description of test or inspection
- d. Weight used for test, in pounds
- e. Testing activity.

700-4.6.6 SUBMARINE WEAPONS HANDLING AND STOWAGE EQUIPMENT.

700-4.6.6.1 Identification of Equipment. Each piece of weapons handling and stowage equipment requiring periodic load testing shall be permanently and conspicuously marked with the ship's hull number, Test Loads/Methods Drawings (TLMD) Log Identification (I.D.) Number, e.g., SSN 637-01, SSN 637-02, etc. Marking shall be done by stamping, vibro-etching or other permanent means. Nylon and dacron web slings shall have stitched-on leather labels and the labels shall be marked with the information described above. When the quantity of Log I.D. numbers assigned to a piece of equipment is less than the number of pieces on board, the Log I.D. numbers may be modified by adding a modifier to the number, e.g., SSN 637-01-1, SSN 637-01-2, or SSN 637-01-A, SSN 637-01-B, etc.

700-4.6.6.2 Recording Test Data. Upon completion of load testing for each piece of equipment, test data shall be permanently recorded on a handling equipment test record sheet ([Figure 700-4-6](#)) provided by the Type Commander. The test shall be witnessed by and the record signed by both a test facility witness and a ship's force witness.

700-4.6.6.3 Marking Defective Handling Equipment. Handling equipment found to be defective shall be affixed with a material condition tag containing a description of the defect(s) and shall be set aside in a designated area for further disposition. The defective equipment shall not be placed in service under any circumstances until repaired and retested to determine its safe working load.

COMSUBLANT/COMSUBPAC FORM 8500/7
HANDLING EQUIPMENT TEST RECORD

1. Equipment Name and Description:		2. Manufacturer or Local Serial Number (Hull-work center-number):		
		3. Log I.D. Number (submarine equip only)		
4. Safe Working Load (SWL) in pounds:		5. Drawing & Piece Number (from ship's plan if not in TLMD):		
6. Dynamic Test Load (DTL) in pounds:		7. MIP Number:		
8. Static Test Load (STL) in pounds:		9. STL freq in months:		
10. Additional Tests/Inspections (Event, freq, and governing documents (do not include PMS, PMMP, or SMPs))				
11. Record of Test Type	Test Facility	Test Facility Witness	Ship's Force Witness	QA Stamp
Action		Sig//	Sig//	
Date		Print//	Print//	
Action		Sig//	Sig//	
Date		Print//	Print//	
Action		Sig//	Sig//	
Date		Print//	Print//	
Action		Sig//	Sig//	
Date		Print//	Print	

Figure 700-4-6. Sample Test Record Sheet

SECTION 5. AMMUNITION STOWAGE

700-5.1 INTRODUCTION

700-5.1.1 GENERAL. This section contains requirements, instructions and information for shipboard ammunition stowage. Detailed specifications for construction of U.S. Navy ships establish and designate ammunition stowage spaces. Magazines are arranged with regard to accessibility; protection from shock, excessive temperature, direct sunlight and weather; and security against movement and unauthorized entry. There are many types of magazines provided on ships. Each magazine is designed specifically for the type of ammunition it is to contain. Magazine types include primary, missile, ready-service and chemical. Primary and missile magazines are designated to hold a ship's service allowance of ammunition. Ready-service magazines are used to stow readily accessible ammunition.

700-5.1.2 MAGAZINE ALTERATIONS. Changes in ammunition stowage spaces, made necessary by a change in types of ammunition or allowances or for any other reason, shall be approved by NAVSEA. Alterations to magazines shall not be made without such approval. For additional information and detailed instructions on ammunition stowage, refer to NAVSEA OP 4, **Ammunition Afloat** ; OP 3206, **Handling and Stowage of Naval Ordnance Aboard Ammunition Ships** ; and OP 4550, **Handling and Stowage of Amphibious Assault Ammunition Aboard Amphibious Ships** .

700-5.2 SAFETY PRECAUTIONS

700-5.2.1 EXPLOSIVES. Explosives shall be handled very carefully to avoid impact or friction that could cause fire, explosion or damage to the material. Explosives shall not be thrown, dropped, dragged or tumbled over the deck or otherwise subjected to shock. Explosives shall not be handled unnecessarily or exposed to inclement weather or direct sunlight. Any indication that loads have been roughly handled shall be promptly reported to the responsible officer.

700-5.2.2 COMBUSTIBLE MATERIAL. Wood and other combustible material shall not be used in ammunition stowage spaces unless specifically authorized. If wood is necessary, only fire-retardant, treated wood shall be used.

700-5.2.3 FLAMMABLE LIQUIDS. Flammable liquid storerooms and paint mixing and issue rooms shall not be located adjacent to magazines.

700-5.3 MAGAZINE SPRINKLER SYSTEMS

700-5.3.1 Primary and missile magazines, ammunition handling rooms and ready-service magazines are equipped with sprinkler systems. Magazine sprinkler systems shall be inspected and tested in accordance with Planned Maintenance System (PMS) procedures, specific technical manuals and NAVSEA OP 4 to ensure they are operating properly.

700-5.4 ALARMS

700-5.4.1 Magazine High-temperature alarm systems, flooding alarm systems and sprinkler alarm systems shall be inspected and tested quarterly to ensure they are operating properly. Refer to PMS procedures and NAVSEA OP 4.

700-5.5 TEMPERATURE CONTROL

700-5.5.1 GENERAL. Temperature stability in magazines is essential to prevent decomposition and deterioration of ammunition. Magazines, ready-service lockers and other ammunition stowage spaces are designed to maintain temperatures within prescribed limits under normal operating conditions. The stability of smokeless powder decreases at stowage temperatures in excess of 100°F. Therefore, every effort shall be made to maintain magazine temperatures below 100°F. Stowage in airtight spaces at temperatures of 70°F or less is satisfactory to ensure normal life of any service powder. Mechanical cooling is necessary if uncooled stowage space temperatures will exceed 100°F. If mechanical cooling is not provided for a magazine that exceeds 100°F, or if it is a topside locker whose temperature exceeds 100°F, artificial methods, such as water spray from a hose or wet canvas covers (see paragraph 700-5.12.1), should be used to reduce the high temperature of the stowage space. See NAVSEA OP 4 for additional requirements when magazine temperatures exceed 100°F.

700-5.5.2 MAGAZINE VENTILATION. Most magazine spaces are equipped with mechanical cooling or ventilation. In magazines without either of these features, cooling, when temperatures exceed 100°F, shall be accomplished by manually controlling supply and exhaust closures in the spaces involved.

700-5.6 ACCESSIBILITY

700-5.6.1 Magazine stowage shall be arranged to provide maximum access to ammunition and containers and adequate space around stowed ammunition and explosives for handling operations and to ensure proper ventilation of the magazine area.

700-5.7 IDENTIFICATION

700-5.7.1 Paint-stenciled labels or painted signs shall be installed on outside surfaces of ammunition stowage spaces, except those surfaces exposed to the exterior of the ship, and interior surfaces with special decorative material. Markings on bulkheads shall be located five feet above the deck and spaced as much as practical, no more than 12 feet apart horizontally. Markings on decks and overheads shall be spaced less than 12 feet apart and located to ensure maximum visibility. Signs or labels shall be on a yellow rectangle (Figure 700-5-1). Appropriate warnings, safety precautions and instructions shall be conspicuously posted in all areas where explosives or other hazardous materials are stowed. Training must be conducted periodically to ensure awareness of the meaning and intent of all warning signs.

700-5.8 CLEANLINESS

700-5.8.1 All magazines and other spaces containing ammunition or explosives shall be kept very clean. Combustible materials such as paper, rags, cotton waste, solvents and volatile liquids are not permitted in or near a magazine except when they are being used for approved purposes. Care shall be taken to ensure that there is not any steel wool, sand, gravel or other abrasive substances on the decks or other working places where explosives

are handled or stowed. Magazine bulkheads, overheads and decks shall be wiped or washed down as necessary to keep them clean. All ammunition holding and securing devices shall be kept free of oil, grease and paint. Exhaust vents within magazines shall be fitted with wire mesh screens and kept clean and in good condition. For operation and maintenance of HVAC systems, see **NSTM Chapter 510, Heating, Ventilating, and Air Conditioning Systems for Surface Ships**.

700-5.9 STOWAGE FITTINGS AND EQUIPMENT INSPECTION

700-5.9.1 Keep all portable ammunition stowage fittings in the spaces in which they are used. Fittings are permitted in aisles and passageways provided adequate handling space remains. The following rules shall apply:

700-5.9.1.1 Quarterly and before getting underway, verify proper placement and tightness of ammunition stowage fittings to ensure stowed ammunition is secure for underway sea conditions.

700-5.9.1.2 Before each use, examine ready-service ammunition stowage hooks, latches, pins and straps for damage and deformation.

700-5.9.1.3 Before each use, examine stowage tracks, racks, dollies, chocks, lashings and fittings for damage, misalignment, broken or cracked welds, and loose or missing components.

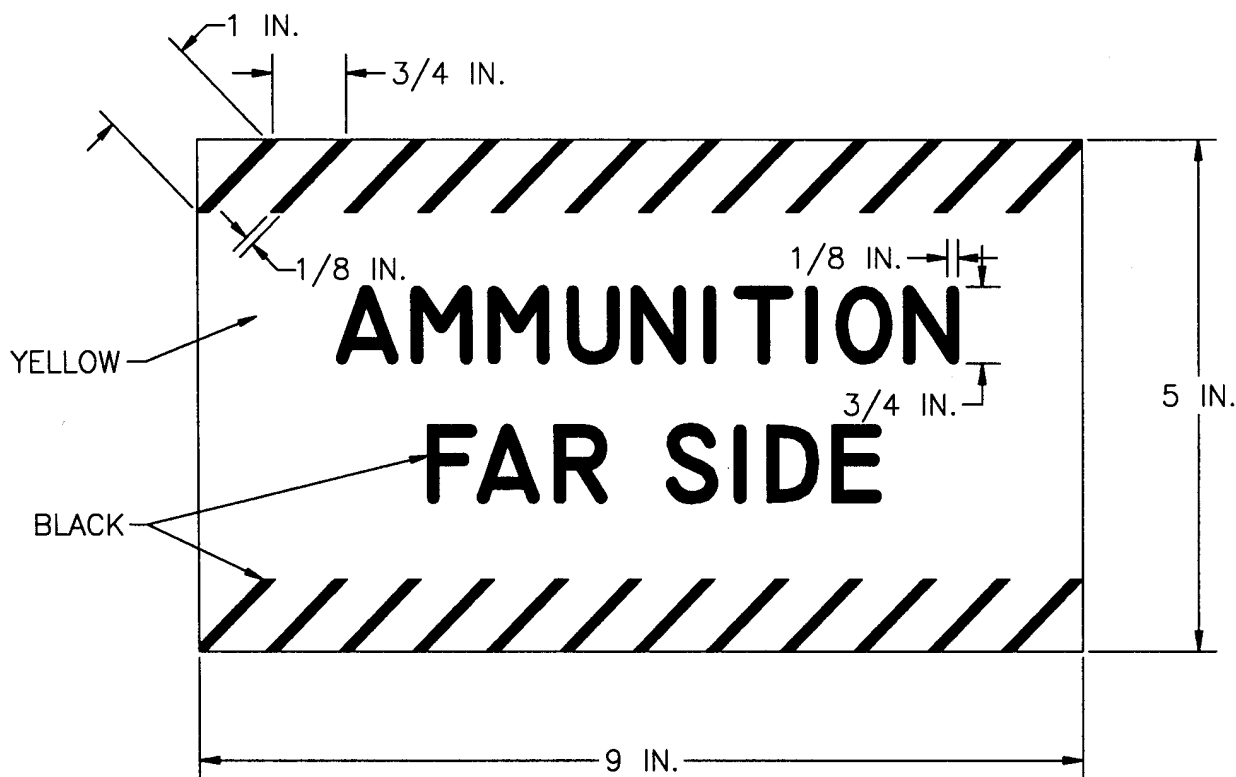


Figure 700-5-1. Sign on Outside of Ammunition Stowage Space

700-5.9.1.4 Before each use, check that equipment and fittings are operable and that painting, or excessive corrosion or wear, has not made them inoperable.

700-5.9.1.5 Before each use, inspect the dolly lashing strap securing bolt and nut assemblies to ensure they are free to turn in the dolly ears. Overtightening the bolts can crack the ears.

700-5.9.1.6 Portable battens and stanchions in magazines are fitted with toggles or other latching devices to prevent the fittings from becoming disengaged, thereby allowing the ammunition to shift during shocks, explosions or in heavy seas. Stowage shall be inspected quarterly to ensure that the securing devices are in place and in working order.

700-5.10 LOAD TESTING

700-5.10.1 SURFACE SHIPS. Load testing of stowage tracks, racks, dollies, chocks, fittings, lashings, portable battens and stanchions on board surface ships is not required after the original testing or certification. Tiedown fittings in the deck shall be load tested at 200 percent of rated load following initial installation. Only 10 percent of the tiedown fittings are required to be tested. If any of these fittings fail the test, all of the tiedown fittings shall be load tested.

700-5.10.2 SUBMARINES. Load testing of submarine stowage equipment shall be in accordance with the applicable Test Loads/Methods and Inspection Procedures drawings listed in [Table 700-4-2](#).

700-5.11 REGULATIONS FOR AMMUNITION STOWAGE

700-5.11.1 GENERAL. General regulations for stowage of ammunition and explosives are contained in NAVSEA OP 4, OP 3206 and OP 4550. Generally, magazines are provided for each type of ammunition to be stowed, with explosives and explosive components being stowed in specifically designated stowage spaces. If separate stowage for designated ammunition or explosives is not feasible then stowage shall conform to the compatibility charts shown in NAVSEA OP 4.

700-5.11.2 PRACTICE, DUMMY/DRILL AMMUNITION AND INERT COMPONENTS. Practice, dummy/drill ammunition, and inert components may be stowed with the service ammunition it simulates or with which it is used. In such cases, the items shall be segregated to the maximum extent possible. Drill and practice ammunition stowage locations shall be tagged "FOR PRACTICE ONLY."

700-5.12 STOWAGE LOCATION

700-5.12.1 The location of lockers, chests and racks permanently attached to the ship's structure shall not be changed without NAVSEA approval.

700-5.13 READY-SERVICE LOCKERS

700-5.13.1 DESCRIPTION. Ready-service lockers are used to stow weapons, ammunition and ordnance components such as small arms, ammunition, grenades, incendiary rockets, chaff rounds, detonators, pyrotechnics and chemicals in the areas where these components are used. The lockers are independent units which are bolted or

welded to the deck and, where practicable, are located against and secured to bulkheads. Lockers are constructed of steel. Locker details are shown in NAVSEA drawing no. 804-1360106. All lockers which are used for incendiary ordnance shall be located at the deck edge and equipped with a jettisoning device that releases the locker overboard in an emergency. Ready service lockers shall be secured in accordance with paragraph [700-5.22.1](#). Existing high security hasps and locking devices not in conformance with 1300 series hasps need not be replaced until they are damaged to a condition beyond repair.

700-5.13.2 SUNSHIELDS. Sunshields are used to protect lockers from direct sun. These sunshields are removable for cleaning and painting. Air space between the shield and the locker permits free air circulation for assistance in temperature control. Care must be taken to ensure that the shields are not crushed against the locker. Under unusually hot conditions, further shading of the lockers or covering them with wet canvas or matting may be necessary to keep temperatures within acceptable limits. Sun shields shall be painted white.

700-5.13.3 FLARE LOCKERS. Special ready-service flare lockers are provided at outboard locations on aircraft carriers for temporary stowage of aircraft parachute flares. The lockers are fitted with jettisoning devices in the event of inadvertent flare-ignition or major conflagration in the vicinity of the lockers.

700-5.13.4 LOCKER USE. Lockers shall be kept clean, painted and ready for immediate use. When ready-service lockers are painted, care shall be taken to keep paint off the rubber gaskets. Paint deteriorates the rubber and reduces gasket effectiveness. Ammunition is not normally kept in ready-service lockers except during fleet exercises or under increased readiness conditions. Under these conditions, the lockers shall be used only for stowage of ammunition and not for handling, movement or other uses.

700-5.14 GUN AMMUNITION

700-5.14.1 Test and drill ammunition shall be stowed in accordance with paragraph [700-5.11.2](#). Cartridge tank stowage fittings shall be periodically examined to ensure that the fittings are properly installed and that tanks are secure in their dunnage. Turret projectiles are stowed in the barbettes. Refer to NAVSEA OP 4 for detailed guidance for stowage of powder, projectiles and fixed ammunition.

700-5.15 BOMBS AND MISSILES

700-5.15.1 Bomb and missile stowages are adjustable to accommodate different sizes and types. These weapons shall be stowed and secured with tiedowns, stanchions, battens, chocks and other dunnage provided in the magazine.

700-5.16 FUSES, PRIMERS, BOOSTERS, AND DETONATORS

700-5.16.1 Fuses, primers, detonators, and boosters shall be stowed only in spaces specifically provided for them. These spaces are located so as to meet the requirements that they be separated from other types of explosives and be stowed a specific minimum distance from any electrical apparatus, steam pipes and source of flame. Except when required for ready-service ammunition, fuses and boosters shall be stowed in their individual packaging or in their shipping containers. The following exceptions are allowed.

700-5.16.1.1 Auxiliary boosters and boosters which do not have a detonator assembled with them may be stowed with the bomb type ammunition to which they belong.

700-5.16.1.2 Boosters that are an integral part of the bomb type ammunition and that are designed for stowage with bomb type ammunition, need not be removed from the ammunition for separate stowage.

700-5.16.1.3 Fuses and boosters which are not an integral part of the bombs shall not be removed from their stowage containers until required for assembly.

700-5.16.1.4 Primers shall be stowed in a small arms magazine.

700-5.17 TORPEDOES

700-5.17.1 AIR LAUNCHED. Torpedoes that are destined for air launch generally arrive on the ship with the air drop kit installed. These torpedoes are transported and stowed in their shipping containers except in frigates, destroyers and cruisers where they are stowed bare in the same stowage chocks used for tube fired torpedoes.

700-5.17.2 TUBE-FIRED. Tube-fired torpedoes are stowed bare (with applicable nose and tail protection) in shock-mitigating chocks when required. If possible, stowage shall be arranged so that the torpedoes can be placed in the chocks in a nose-to-tail configuration and that torpedoes can be removed with minimum of shifting of other torpedoes. For information on submarine shock-mitigating stowage systems for torpedoes, refer to the applicable NAVSEA general arrangement drawings (series 6206, 6620 and 6659).

700-5.18 LANDING FORCE OPERATIONAL RESERVE MATERIAL (LFORM) AMMUNITION

700-5.18.1 The ordnance portion of LFORM is stowed in magazines designated AMMUNITION/LFORM or in approved lockers as appropriate. Every effort shall be made to stow LFORM ammunition allowances in Amphibious Warfare (AW) ships in compliance with compatibility groups. Refer to NAVSEA OP 4550 and OP 4.

700-5.19 CHEMICAL WEAPONS

700-5.19.1 DIRECTION. Chemical ammunition classified as lethal or incapacitating shall not be carried aboard ship unless specifically authorized by CNO.

700-5.19.2 AUTHORIZED CHEMICAL AMMUNITION. Chemical ammunition shall normally be stowed in dry, well-ventilated lockers, containers or spaces above deck which are either readily jettisonable or convenient for jettisoning in the event of an emergency. Such stowage shall be located away from the ship's ventilation intakes or other openings. Different types of chemical ammunition shall normally be stowed separately. Separate stowage is mandatory if the quantity of any type of chemical ammunition is large. All personnel, particularly damage control repair party and gunnery personnel, engaged in handling and stowing munitions loaded with chemical agents shall have specialized training in the procedures to be used.

700-5.20 SMALL ARMS SECURITY

700-5.20.1 Shipboard stowage for small arms, small arms ammunition and other sensitive ordnance (such as grenades, demolition charges and pyrotechnics) shall be installed and maintained to provide a high level of security against unauthorized access. Armories, Security Force Equipment Issue rooms, all magazines, and topside

lockers shall meet the requirements of OPNAVINST 5530.13, Department of the Navy, **Physical Security Instruction for Sensitive Conventional Arms, Ammunition and Explosives (AA & E)** .

700-5.21 HIGH-SECURITY HASPS AND PADLOCKS

700-5.21.1 A locking system consists of a hasp assembly onto which a compatible lock is placed. The locking system is typically applied to doors, hatches and frames that need to provide resistance to forced entry. Each element in the locking system is compatible and structurally similar, therefore the whole system offers relatively uniform resistance to intrusion. Access doors, armory covers, small arms ammunition magazines, small arms lockers, sensitive ordnance magazine stowage spaces and topside sensitive ordnance lockers shall be secured with a 1300 series high-security hasp in accordance with **NSTM Chapter 604, Locks, Keys and Hasps** . Other high security hasps and locking devices described in **NSTM Chapter 604** found in existing installations need not be replaced with 1300 series hasps until they are damaged to a condition beyond repair.

700-5.22 DOORS AND HATCHES

700-5.22.1 ENTRANCES. Entrances to AA & E spaces shall be held to a minimum, consistent with safety and security requirements and efficient operations. Doors to AA & E spaces shall be constructed of 14-gauge steel, minimum. Sheathing of existing doors with 14-gauge steel is acceptable. On aluminum hull ships, doors as designed shall suffice. However, double-walled extruded aluminum (NAVSEA dwg 805-1749247) and aluminum honeycomb-type construction are not acceptable. Access doors for armories and small arms magazines shall be in accordance with NAVSEA dwg 805-1400075 for non-watertight construction and NAVSEA dwg 805-1400066 for watertight construction. One 4-inch diameter fixed light, NAVSEA dwg 805-1400055, shall be provided in all armory access doors. A hook and staple shall be installed on the interior of the armory access door.

700-5.22.2 ENTRANCE LIGHTING. Main personnel entrances to AA & E spaces shall be provided with normal and emergency lighting (may be relay/battery-operated battle lanterns) adequate to provide sufficient lighting for examination of locking devices during periods of reduced visibility. Topside lockers and entrances opening onto weather decks are excluded from this requirement.

700-5.22.3 ENTRANCE SIGNS. Main personnel entrances to AA & E stowage spaces shall be posted with signs reading "RESTRICTED AREA KEEP OUT" and "AUTHORIZED PERSONNEL ONLY." Topside lockers and entrances opening onto weather decks do not require such signs.

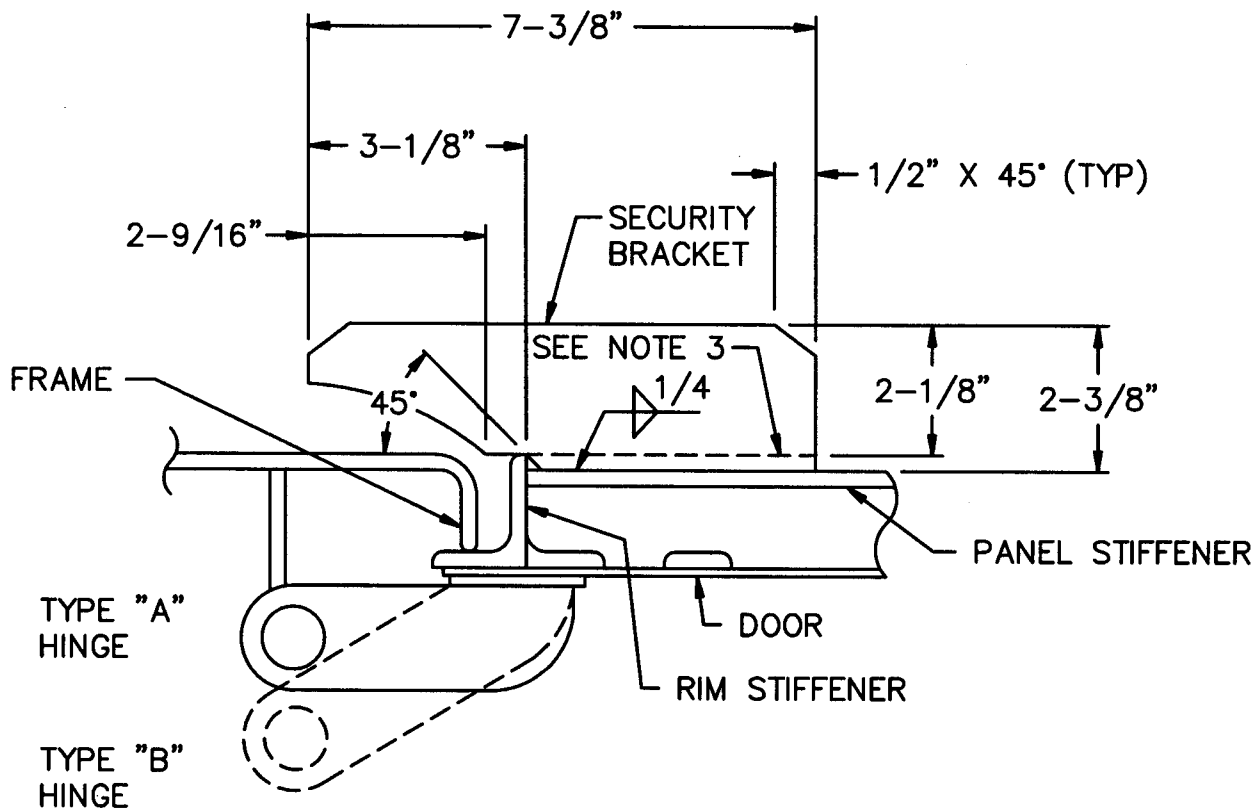
700-5.22.4 DOOR HINGES. Access doors shall be hung with hinges that have nonremovable, fast-type pins; or hinges with peened-over pins. Whenever possible, hinges shall be located within the secured area. If hinges must be located outside the secured area, the door shall be fitted with one hinge security bracket behind each external door hinge to prevent the door from opening if the hinge pins are removed. Brackets that are in general conformance with [Figure 700-5-2](#), minimum 1/4-inch thick, shall be edge-welded to the door stiffeners on both the inside and the hinge side of the door, and shall extend past the door frame when the door is in the closed position.

700-5.22.5 LOCKER HINGES. Locker doors and covers shall be hung with hinges with peened over pins. Hinges shall be located within the secured area whenever possible. If hinges must be located outside the secured area, doors and covers shall be fitted with one hinge security bracket behind each external door hinge to prevent the door or cover from opening if the hinge pins are removed. Brackets that are in general conformance with

Figure 700-5-3, minimum 1/4-inch thick, shall be edge-welded to the door stiffeners on both the inside and the hinge side of the door or cover, and shall extend past the door or cover frame when the door or cover is in the closed position.

700-5.23 ARMORIES AND SMALL ARMS MAGAZINE

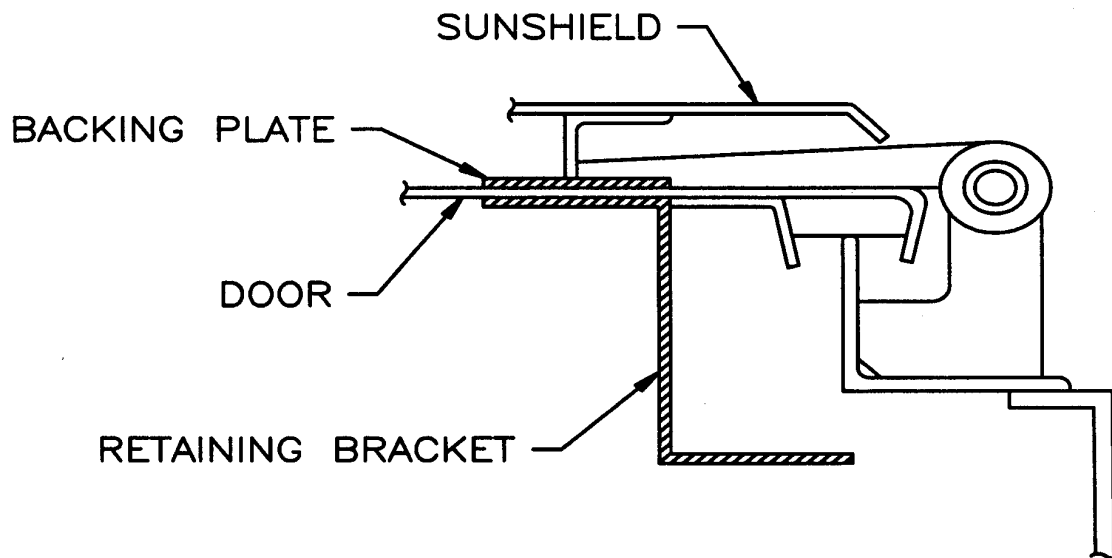
700-5.23.1 DESCRIPTION. The ship's armory provides secure, orderly stowage; convenient segregation; and maintenance space for small arms and other ordnance material specified in each ship's allowance. The small arms magazine provides safe, orderly and segregated stowage for the ship's small arms ammunition.



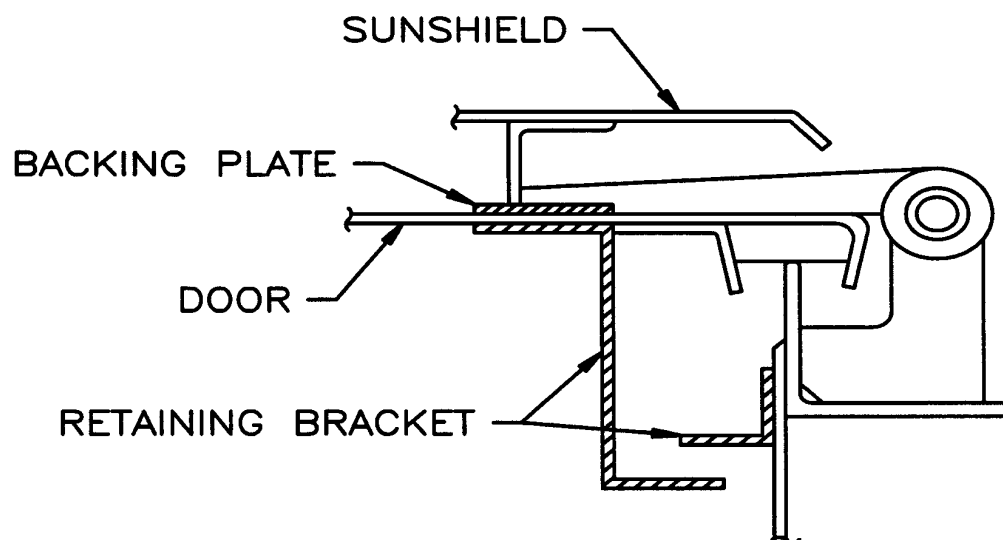
NOTES:

1. MATERIAL 10.2 NO. PL (1/4 IN THICK) MILD STEEL
2. THREE BRACKETS PER DOOR. ONE BEHIND EACH HINGE.
3. IF PANEL STIFFENERS ARE SAME DEPTH AS RIM STIFFENERS, CUT BRACKETS ON DOTTED LINE.

Figure 700-5-2. Magazine and Armory Access Door Security Bracket



LOCKER WITH INTERIOR ANGLE



LOCKER WITH EXTERIOR ANGLE

Figure 700-5-3. Topside Locker Retaining Bracket

700-5.23.2 CONSTRUCTION. Armories and small arms magazines, except on nonmagnetic mine warfare ships, shall be constructed of 14-gage steel, minimum. Aluminum plate that is part of an exterior bulkhead aluminum superstructure is also acceptable for armories. In existing installations, aluminum bulkheads 1/8-inch thick or thicker may be retained. Bulkheads constructed of double-walled extruded aluminum and aluminum honeycomb-type bulkheads are not acceptable for armories. Armory bulkheads shall be of all-welded construction, except that solid core rivets or mechanical fasteners (MIL-P-23469 or MIL-P-23470) shall be used for fastening dissimilar metals. Rivets and mechanical fasteners shall be a minimum of 1/4-inch in diameter.

700-5.23.3 SMALL ARMS STOWAGE REQUIREMENTS. Armories used solely for small arms stowage/maintenance may use metal gun racks with rack locking devices (i.e., locking bar, cable, chain, etc., with a secondary Navy padlock) for stowage of small arms provided that the armory meets all other established criteria. Within armories, a GSA-approved container may be used to stow small arms. Small arms stowed in lockers or arms rooms having high-security hardware that are located in or have sole access from within an armory, meeting high security standard criteria, do not require rack locking devices.

700-5.23.4 SMALL ARMS LOCKERS. Small arms lockers are used to stow small weapons such as pistols, rifles, shotguns and machine guns. They are constructed from steel. Small arms lockers shall be in accordance with NAVSEA drawing no. 804-4444648. Pistol lockers shall be in accordance with NAVSEA drawing no. 804-4444649. Small arms lockers shall be secured using the locking systems described in paragraph [700-5.22](#). Security Alert Team (SAT) locker shall be in accordance with NAVSEA drawing no. 804-5184218.

700-5.24 TROOP WEAPONS STOWAGE

700-5.24.1 DESCRIPTION. M16A1 and M16A2 rifles and M249 machine guns, stowed in the Marine Corps troops berthing area, shall be secured in rifle racks constructed in accordance with NAVSEA drawing no. 803-6397388. This rifle rack prevents removal of a rifle from the rack after the rifles have been locked in the rack. The racks are secured or braced vertically to bulkheads and are arranged in a one-high or two-high configuration in the troop's berthing area. The rifle lock shall be the dead-bolt type in the locked position. Each rifle lock shall be keyed differently and a minimum of three keys per lock shall be provided. All locks for embarked troop weapons may be master-keyed with two master keys provided. Troop rifle and weapons stowage in the troop armory shall be in bins in accordance with NAVSHIPS drawing no. 711-2288608 (PSNS). The weapons in the bins shall be secured with locking bars or an expanded metal enclosure fitted with a padlock, Mil Spec MIL-P-17802E.

700-5.24.2 EXCEPTIONS. When troop arms and ammunition exceed the capacity of the troop and the ship's armory, for arms and ship's magazine, for ammunition, and where no other secure space on board is available, the use of metal containers such as CONEX boxes for arms or ammunition stowage is authorized. Such containers shall be equipped to meet approved lock, hasp and hinge protection security criteria. If containers are not equipped with high-security hardware, a sentry with no other prime duties will be assigned by the troop commander to guard the containers.

700-5.25 RIFLE RACK KEY STOWAGE

700-5.25.1 Keys shall be stowed in a locked key cabinet/repository in the ship's armory. Master keys to the key cabinet/repository shall be in the custody of the ship's armory personnel.

700-5.26 SPARE LOCK CYLINDERS

700-5.26.1 To allow for damaged locks and lock rotation for security reasons, spare lock cylinders, totaling ten percent of the total number of locks, shall be numbered (stamped) and stowed in a secure metal container in the ship's armory. Instructions for maintenance and exchange of lock cylinders may be obtained from the lock manufacturer.

700-5.27 SUBMARINE SMALL ARMS AND MISCELLANEOUS SENSITIVE ORDNANCE STOWAGE

700-5.27.1 Submarine small arms and miscellaneous sensitive ordnance are usually stowed in custom-fabricated lockers which do not necessarily meet the requirements specified in this chapter. To achieve proper locker security, retainer brackets (in general accordance with [Figure 700-5-3](#)) shall be installed on the hinge side of locker doors to prevent access by removal of hinge pins. Stiffeners shall be added to the doors to preclude prying them open.

REAR SECTION

NOTE

TECHNICAL MANUAL DEFICIENCY/EVALUATION EVALUATION
REPORT (TMDER) Forms can be found at the bottom of the CD list of books.
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